



United States Department of the Interior

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Subject: Programmatic Biological Opinion for the Revision of the Inyo National Forest
Land Management Plan (Fresno, Inyo, Madera, Mono, and Tulare Counties,
California and Esmeralda and Mineral Counties, Nevada)

INTRODUCTION

This document represents the U.S. Fish and Wildlife Service's (Service) Programmatic Biological Opinion (BO) of the U.S. Forest Service's (USFS) proposed revision of the Inyo National Forest (Inyo NF) Land Management Plan (LMP), and its effects on seven federally-listed species and their designated critical habitat, pursuant to section 7 of the Endangered Species Act of 1973, as amended (ESA; 16 USC 1531 *et seq.*). Your request for formal consultation and Biological Assessment (BA) were received by the Service on November 14, 2017.

The USFS determined that six programs/activities (Fire Management, Vegetation and Fuels Management, Range Management, Recreation Management, Restoration Activities, and Roads and Other Infrastructure) in the revised LMP would adversely affect the federally-listed as threatened Lahontan cutthroat trout (LCT; *Oncorhynchus clarkii henshawi*), Paiute cutthroat trout (PCT; *Oncorhynchus clarkii seleniris*), and Yosemite toad (YT; *Anaxyrus canorus*), and the federally-listed as endangered Owens tui chub (OTC; *Gila bicolor* ssp. *snyderi*), Sierra Nevada yellow-legged frog (SNYLF; *Rana sierrae*), Northern Distinct Population Segment of the mountain yellow-legged frog (MYLF; *Rana muscosa*), and Sierra Nevada bighorn sheep (SNBS; *Ovis canadensis sierrae*). Of these species, YT, OTC, SNYLF, MYLF, and SNBS have designated critical habitat. The USFS determined that the six programs/activities would adversely affect the critical habitat of YT, SNYLF, MYLF, and SNBS. The USFS included

whitebark pine (*Pinus albicaulis*), a Federal candidate for listing under the ESA, in its BA. Federal candidates receive no statutory protection under the ESA; therefore, the Service will not analyze the effects of the proposed action on this species.

On June 15, 2017, the Service issued its *Amended Programmatic Biological Opinion on Nine Forest Programs on Nine National Forests in the Sierra Nevada of California for the Endangered Sierra Nevada Yellow-legged Frog, Endangered Northern Distinct Population Segment of the Mountain Yellow-legged Frog, and Yosemite Toad* (Amended Programmatic; File No. 2014-F-0557-1) to the Pacific Southwest Regional Office of the USFS. In this BO for the revised LMP, the Service will discuss the potential effects to YT, SNYLF, MYLF, and their designated critical habitat as they relate to the six programs described in the BA; however, the USFS agreed on March 16, 2018, to request reinitiation on the Amended Programmatic to include any specific activities under the revised LMP that are not currently addressed in the Amended Programmatic (E. Nordin, U.S. Fish and Wildlife Service, pers. comm. 2018). Until the Amended Programmatic is revised to include any new activities not previously analyzed, those activities that may affect YT, SNYLF, MYLF, and their designated critical habitat will require separate consultations. Otherwise, all activities previously analyzed under the existing Amended Programmatic will continue to be appended under that BO.

The proposed action described below is a “framework programmatic action” as defined in 50 CFR 402.02, where framework programmatic action only establishes a framework for the development of specific future action(s) but does not authorize any future action(s). Under those circumstances, the programmatic action in and of itself does not result in incidental take of listed species. Because a framework programmatic action does not itself authorize any action to proceed, no take is anticipated to result, and, therefore, does not require the provision of an incidental take statement (See 80 FR 26832- 26845 and 50 CFR 402.14(i)(6)). Therefore, this is a programmatic-level consultation that conceptually evaluates effects of project components for which details are not yet known. In the context of the broad management direction provided in the revised LMP and the absence of detailed, site-specific information, this BO reflects the most conservative estimate of the range of effects that may be incurred by the species and their habitats (including designated critical habitat) that occur on the Inyo NF for the following six programs/activities: Fire Management, Vegetation and Fuels Management, Range Management, Recreation Management, Restoration Activities, and Roads and Other Infrastructure. It is understood that any future projects conducted under the direction of the revised LMP over the next 15 years will require separate section 7 consultations.

The Inyo NF retains its responsibility under the ESA to consult on future projects (conducted under the revised LMP) that may affect listed species regardless of the project’s consistency with the proposed action considered in this BO. Future projects and their potential to adversely affect a listed species, or critical habitat, will be analyzed at the project level and a separate jeopardy/adverse modification determination will be made at that time.

In completing this BO, the Service used the following: (1) The project BA (USFS 2017); (2) past section 7 consultations; (3) information and reference material located within the Reno Fish and Wildlife Office (FWO) files; and (4) personal communication records between USFS and Service staff (meeting, e-mail, and telephone conversations). A record of this consultation is on file in the Reno FWO, Reno, Nevada.

CONSULTATION HISTORY

The Service did not issue a BO for the Inyo NF's existing LMP, which was approved in 1988; however, it did issue a BO for the Sierra Nevada Forest Plan Amendment (File No. 1-1-03-F-2638). The BO for the Sierra Nevada Forest Plan Amendment was issued by the Sacramento FWO on December 11, 2003, and it analyzed the effects of the USFS's revised standards and guidelines on 20 federally-listed species, 4 candidate species, and designated critical habitat located across 11 Sierra Nevada National Forests, including the Inyo NF. The following timeline pertains to the consultation associated with this revised LMP.

- **December 12, 2014:** The USFS sent a letter to Service staff at the Sacramento FWO to notify them that the Sierra, Sequoia and Inyo National Forests were preparing to revise their LMPs and that the USFS would be preparing a BA.
- **May 27, 2015:** The USFS reviewed the Sacramento FWO website to determine which federally-listed, proposed, or candidate species may be affected by the revision of the Inyo NF's LMP.
- **January 21, 2015:** The USFS and Service met to discuss the project, general timing, participants, and proposed species to be covered in the BA.
- **August 20, 2015:** The USFS and Service met to continue the discussion about the planning process and opportunities for the Service to engage on non-listed species of interest. During this meeting, the Service's approach to programmatic consultation was discussed along with approaches to address conservation measures in the revised LMPs. The preliminary schedule was also discussed along with initial dialog on whether to prepare one BA for all three National Forests or if separate documents should be prepared. The USFS and Service agreed on a list of species to consider in the BA.
- **March 24, 2017:** The USFS and Service had a meeting to discuss the decision to prepare a separate BA for the Inyo NF and initiate formal consultation in 2017. At this meeting, the USFS and Service agreed to exclude those species for which the Service recently determined listing was not warranted. It was also agreed to only analyze the preferred alternative and to use the Service's Information for Planning and Consultation (IPaC) system to request a species list.
- **March 27, 2017:** The USFS used IPaC to request and receive an official species list for the Inyo NF administrative boundary.
- **April 28, 2017:** The Service confirmed in an e-mail the list of species that do not require analysis in the BA.
- **July 26, 2017:** The USFS renewed the Service's IPaC list for the same project area. There were no changes in the list of species.
- **October 18, 2017:** The USFS and Service had a telephone call to discuss the Service's comments on the draft BA as well as suggestions for completing the BA.

- **October 31 and November 3, 2017:** The USFS and Service met to discuss content, format, and submission of the BA.
- **November 5, 2017:** The USFS renewed the Service's IPaC list for the same project area. There were no changes in the list of species.
- **November 14, 2017:** The USFS submitted the BA for the Inyo NF's revised LMP to the Service.
- **February 9, 2018:** The USFS and Service had a telephone call regarding the three Sierra amphibians and their designated critical habitat to discuss what information the USFS needed to provide for the Service to determine if the revised LMP was covered under the Amended Programmatic or if it would need to be included under this consultation.
- **February 14 – March 2, 2018:** The USFS provided additional information to the Service regarding the revised LMP.
- **March 16, 2018:** The USFS and Service had a telephone call to discuss how the Amended Programmatic would be addressed in this BO, and how the Service needed additional clarification on domestic goat packing, herbicide application, and restoration activities in designated Wilderness. The USFS also agreed to reinstate consultation on the Amended Programmatic to include any programs and activities in the revised LMP that were not previously addressed.
- **March 20, 2018:** The USFS provided additional information on the use of herbicides on the Inyo NF.
- **March 27, 2018:** The USFS provided updated language regarding domestic goat packing on the Inyo NF.
- **March 28, 2018:** The USFS provided additional information on the range of restoration activities that could occur in designated Wilderness.
- **March 28, 2018:** The Service emailed the USFS an outline clarifying how Sierra Nevada amphibians and the Amended Programmatic would be addressed in the BO.
- **April 5, 2018:** The Service sent an e-mail to the USFS providing recommendations on the language in the Inyo NF Plan Revision as it applied to the use of domestic pack goats on USFS land.
- **April 10, 2018:** The USFS sent the Service an e-mail with its recommendations on the language in the BA as it pertained to the use of domestic pack goats.
- **May 8, 2018:** The USFS and Service had a telephone call to clarify the Inyo NF's intended action relating to current and future domestic pack goat use in the area identified as a high/unacceptable risk of contact with SNBS.
- **May 29, 2018:** The Service received via U.S. Postal Service, a copy of the amended portions of the BA with the USFS commitment to reduce to the maximum extent practicable, the risk of disease transmission from domestic sheep and goats, including pack goats, to bighorn sheep.
- **June 7, 2018:** The Service received comments and edits from the USFS on the draft BO via e-mail.

DESCRIPTION OF THE ACTION AREA AND PROPOSED ACTION

Description of the Action Area

The revised LMP includes the entire Inyo NF, which encompasses nearly 2 million acres (ac) of National Forest System lands, including 967,039 ac of designated Wilderness. The Inyo NF covers the southeastern Sierra Nevada mountain range and the White Mountains of California and Nevada (~~Figure 1~~~~Figure 1~~~~Figure 1~~). The Inyo NF also manages 26,711 ac of parcels that occur on the adjacent Sierra and Humboldt-Toiyabe NFs. The USFS would manage these parcels according to the direction in the Inyo NF's revised LMP. In this BO, the Service considers the action area to be equivalent to the plan area.

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Description of the Proposed Action

The USFS proposes to revise the Inyo NF's current LMP because it is outdated. In 1988, the USFS completed the Inyo NF's Land and Resource Management Plan and, since then, it has amended the plan several times.

The revised LMP would guide the USFS's decisions on activities and uses on the Inyo NF, identify long-term or overall desired conditions, and provide general direction for achieving those desired conditions. The revised LMP does not contain or authorize any site-specific projects or activities, nor does it allocate resources, specify particular methods that should be used, or guarantee specific results.

The revised LMP includes six plan components that guide future project and activity decision-making, including the following five components that are required (described below): desired conditions, objectives, standards, guidelines, and suitability of lands. Goals are an optional plan component. The plan components, which include the Fire Management, Vegetation and Fuels Management, Range Management, Recreation Management, Restoration Activities, and Roads and Other Infrastructure programs, provide direction and can apply forest-wide to land of specific character (*e.g.*, vegetation types), or specific parcels of land (*e.g.*, management areas and designated areas). The revised LMP also includes a monitoring program that measures management effectiveness and assesses progress toward achieving or maintaining the desired conditions and objectives through a set of monitoring questions and associated indicators. When conditions change beyond what was anticipated in the revised LMP, a responsive process using narrow amendments can be used to adjust LMPs between revisions.

The six components are described as follows:

A “**desired condition**” is a description of specific social, economic, and/or ecological characteristics of the plan area, or a portion of the plan area, toward which management of the land and resources should be directed. A desired condition description is specific enough to allow progress toward achievement to be determined but does not include a completion date.

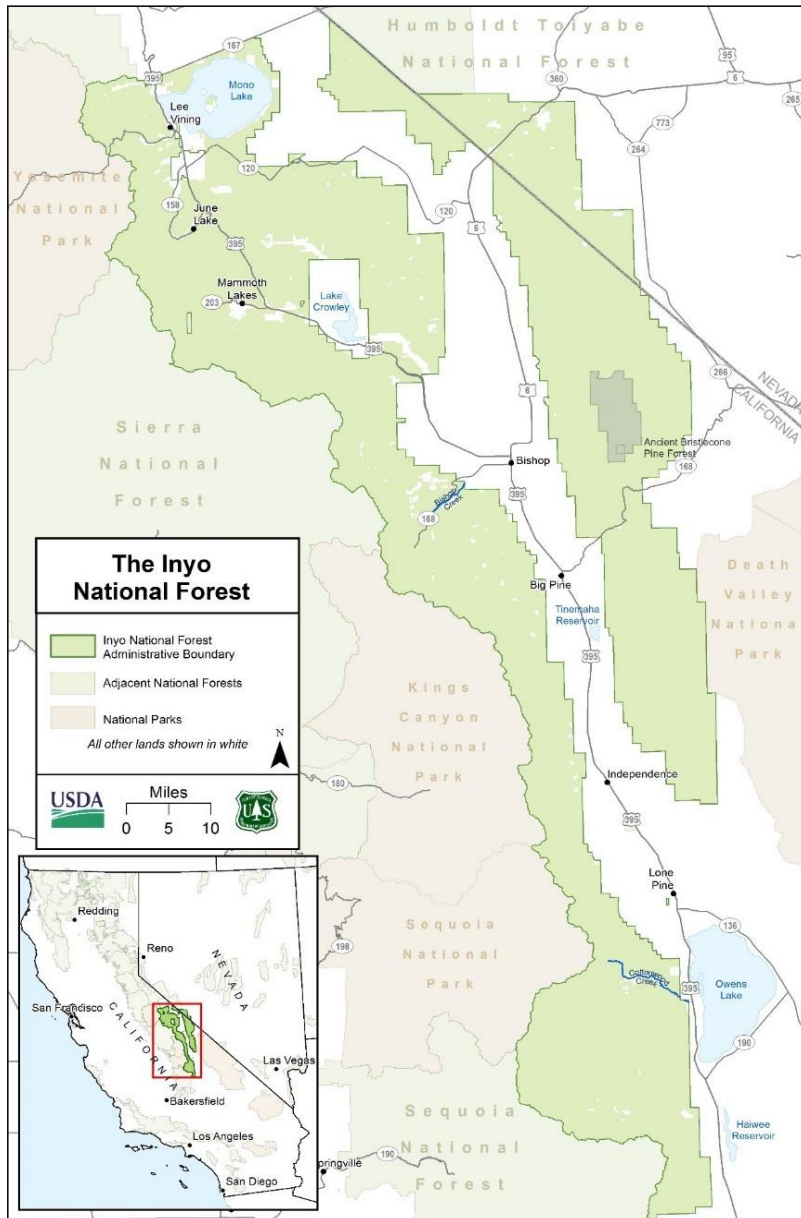


Figure 1. Location of the action area (*i.e.*, plan area) on the Inyo National Forest (USFS 2017).

An “**objective**” is a concise, measurable, and time-specific statement of a desired rate of progress toward a desired condition or conditions. Objectives are based on reasonable foreseeable budgets.

A “**standard**” is a mandatory constraint on project and activity decision-making, established to help achieve or maintain the desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements.

A “**guideline**” is a constraint on project and activity decision-making that allows for departure from its terms, so long as the purpose of the guideline is met. Guidelines are established to help achieve or maintain the desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements.

The “**suitability of lands**” is determined for specific lands within the plan area. The lands are identified as suitable or not suitable for various uses or activities based on desired conditions applicable to those lands. The suitability of lands is not identified for every use or activity. If certain lands are identified as not suitable for a use, then that use or activity may not be authorized.

A “**goal**” is a broad statement of intent, other than desired conditions, usually related to process or interaction with the public. Goals are expressed in broad, general terms, but do not include completion dates. Goals may be used to describe overall desired conditions of the plan area that are also dependent on conditions beyond the plan area or USFS authority. Goals may be used in lieu of objectives if the outcome is the result of a partnership between the USFS and other land owners within the broader landscape, or if the outcome is uncertain, because it could be beyond the fiscal capability of the unit.

The USFS determined that six programs/activities could, over the life of revised LMP, adversely affect LCT, PCT, OTC, SNYLF, MYLF, YT, SNBS, and designated critical habitat for SNYLF, MYLF, YT, and SNBS. These six programs/activities are: Fire Management, Vegetation and Fuels Management, Range Management, Recreation Management, Restoration Activities, and Roads and Other Infrastructure. Because the revised LMP provides the framework for future management, but does not authorize projects or require specific activities to occur, the following paragraphs generally describe the types of actions and activities that would occur under each program.

Fire Management

Fire management focuses on the USFS’s strategic approach to managing naturally-ignited fires across the landscape. Fire management includes planning and actions related to the management of wildfire ignitions. In the Fire Management section of the BA, the USFS described wildfire suppression activities. The Service is not analyzing the effects associated with wildfire suppression activities in this BO as this would occur during emergency consultation. The Service is only considering how the USFS’s identification of Strategic Fire Management Zones would affect land management in those areas, federally-listed species, and their habitats (including designated critical habitat).

The revised LMP would replace the current fire management approach of focusing on the Defense Zone and the Threat Zone, which are two distance-based areas closest to communities in the wildland urban interface, with a risk assessment-based approach that identifies four Strategic Fire Management Zones on the Inyo NF. The USFS created these four zones based on the likelihood and intensity of wildfire and the risk wildfire poses to highly-valued resources and assets. These four zones are: Community Wildfire Protection Zone, General Wildfire Protection Zone, Wildfire Restoration Zone, and Wildfire Maintenance Zone (Figure 2).

The Community Wildfire Protection Zone and General Wildfire Protection Zone are conceptually analogous to the former Defense and Threat Zones although they do not cover exactly the same areas. They represent areas where wildfires could pose a direct threat to communities and assets and are most likely to have a high risk of negative outcomes. Within these areas, the USFS would manage most wildfires through active fire suppression actions, and it would prioritize vegetation and fuels management activities to lessen wildfire risks, where feasible.

The USFS divided the remaining area into a Wildfire Maintenance Zone and a Wildfire Restoration Zone. The intent in these zones is to restore fire to the landscape as an ecological function. The Wildfire Maintenance Zone includes most designated Wilderness, areas where the USFS expects most wildfires to pose low risks to highly-valued resources and assets, and where they would provide ecological benefits. The Wildfire Restoration Zone covers an area where fire risks are mixed. Some wildfires may pose a moderate to high risk to highly-valued resources and assets while others may pose a low to moderate risk depending upon the current and predicted weather conditions and the condition of fuels and vegetation.

The USFS would evaluate all naturally-ignited wildfires to determine if they can be safely managed through a variety of fire management strategies and tactics to restore fire to the landscape. In some cases, the USFS would suppress wildfires that pose too high a risk. The USFS estimated that the number of acres where it would manage wildfires to meet resource objectives would increase from approximately 11,300 ac per decade to 64,000 ac per decade. In other words, the amount of acres burned could increase by over five times the current amount, since the USFS would allow wildfires to burn rather than actively suppressing them.

Vegetation and Fuels Management

The USFS would conduct a variety of vegetation and fuels management activities, such as timber harvest, reforestation, hazard reduction, fire or fuels treatment, forest health and rangeland improvement, watershed restoration, and wildlife habitat enhancement. There is a limited timber sale program on the Inyo NF. The harvest and removal of trees occurs primarily as commercial fuelwood and for other forest products, such as posts, poles, or other specialty wood products. Personal use fuelwood collection involves the public removing downed trees and small dead trees, mostly near roads.

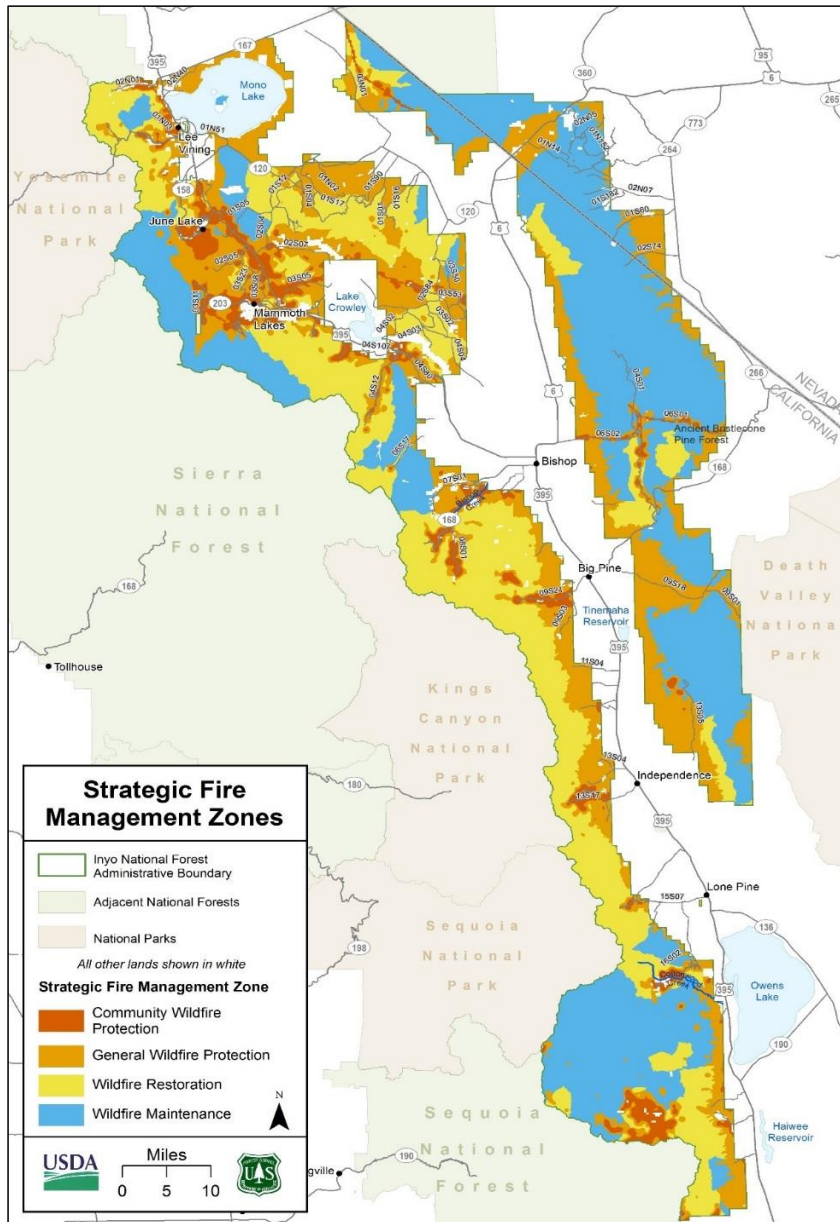


Figure 2. The location of all four Strategic Fire Management Zones in the action area (USFS 2017).

The USFS expects that vegetation management activities would focus on thinning forest stands, especially in areas that would facilitate larger prescribed burns or that can be strategically used to manage wildfires. For vegetation management projects, the USFS would pile and burn excess vegetation, or it may be removed by the public for personal fuelwood. Small to heavy equipment or chainsaws could be used to cut trees and vegetation. Some salvage of dead trees could occur, however, due to the limited forest product infrastructure (*i.e.*, sawmills), most projects in areas with dead trees would focus on hazard tree management and fuels management and, where possible, support fuelwood collection. Associated activities could include road reconstruction, road maintenance, and construction of piling areas using heavy equipment. The USFS anticipates that the construction of new permanent roads would be limited, and more typically, activities would require the use of existing roads or short sections of temporary road would be constructed. Skid trails (a temporary, non-structural pathway over soil created by dragging or skidding felled trees or logs) created during these activities would have water bars installed for erosion control and temporary roads would have design standards to minimize dust and erosion and plans for rehabilitating the site when roads are no longer needed.

Vegetation treatment could be followed by conifer reforestation, which could include: preparation of the treated site to remove excess fuels and competing vegetation by means of mechanical or hand piling; single or multiple chemical applications to reduce competing vegetation; tree planting or allowing for natural seeding; and stand management over time, as needed. Reforestation could also include rehabilitating trails and roads and planting within and adjacent to facilities to provide shade and restore scenic character. Reforestation could also occur in areas that burn at high severity outside of the natural range of variation that leave large areas without future conifer seed sources. In some cases, other non-conifer native vegetation would be planted at restoration sites to restore native species diversity.

Fuels management activities are intended to reduce the size, cost, and damage from wildfire as well as restore fire to the landscape as a natural ecological process. Fuel biomass is altered by: changing fuel type (horizontal and vertical continuity); creating fuel breaks; reducing or altering fuels over extensive areas as described above for vegetation management; conducting prescribed burns; or managing naturally-ignited wildfires. Fuels management would also be focused on reducing heavy concentrations of dead biomass, such as logs and slash where they would damage nearby resources if burned under wildfire conditions. These materials may be rearranged, removed, or burned to reduce fuel loading.

Within both the General Wildfire Protection Zone and the Wildfire Restoration Zone (Figure 2), the USFS would emphasize using strategically placed fuels reduction treatments along roads and ridgelines, and restoring vegetation heterogeneity toward the natural range of variation over larger areas. These fuels reduction treatment areas would be located where they could lessen the negative risks of wildfires and create opportunities for the USFS to more easily manage naturally-ignited wildfires that could provide benefits to natural resources.

Activities associated with prescribed fire include understory burning, pile burning, and broadcast burning by means of hand ignition using drip torches, other ignition devices, or by using helicopter mounted ignition devices. The construction of hand line or holding lines using hand equipment or mechanical equipment is often needed if existing roads or natural barriers do not exist. Prescribed burns can last for one or more days and burning or smoldering of vegetation

inside of large burns could last for months until sufficient rainfall occurs. Repeat burning of areas may be needed to reduce fuels and to move vegetation towards desired conditions. The USFS estimated that the number of acres of mechanical treatments to address vegetation and fuels would increase slightly from the current 20,000 ac per decade to 25,000 to 30,000 ac per decade under the revised LMP. The acres of prescribed burn treatments would also increase slightly from the current 18,000 ac per decade to 20,000 to 25,000 ac per decade.

Range Management

Range management includes activities related to the development, administration, and protection of range resources, and includes the permitting and regulation of grazing use of all kinds and classes of livestock on National Forest System lands. Livestock grazed on rangeland include cattle, domestic sheep, and horses. Saddle stock (*i.e.*, horses) are used to manage the livestock on the rangeland. A primary purpose of range management is to provide forage for commercial livestock operations while also protecting other resources.

Activities associated with range management would include livestock handling, moving, herding, gathering, salting, and other ordinary husbandry practices. Range management could also include implementation and maintenance of structural and non-structural improvements. Structural improvements are permanent features designed to facilitate livestock management and control distribution and movement of livestock. Some examples of structural improvements are dams, impoundments, ponds, pipelines, fences, corrals, wells, and trails. An example of non-structural improvement is managing vegetation to improve forage values or to control invasive species.

The USFS has an established process for grazing permit administration. Term grazing permits are generally issued by the USFS for a period of 10 years and authorize a permittee to graze livestock on their designated allotment(s). An allotment is a designated area of land suitable for domestic livestock grazing. The USFS would develop and implement Allotment Management Plans to ensure livestock use meets rangeland management objectives and are consistent with the revised LMP. Allotment Management Plans would include the grazing strategies needed to meet rangeland and other conservation objectives within the allotment through grazing systems, stocking rates, kind and class of livestock, period of use, season of use, livestock distribution, and range improvements. The Allotment Management Plan includes Annual Operating Instructions as well as annual adjustments to management based on monitoring and site-specific objectives, and it would be revised to reflect changes in required project design criteria. The USFS incorporates the Allotment Management Plans into the term grazing permit.

There are currently 54 allotments on the Inyo NF that are open to grazing by cattle, domestic sheep, and wild horses and burros. Some of these allotments are vacant or closed. A vacant allotment is one that is not currently being grazed, and a closed allotment is one that is no longer grazed.

The USFS is not proposing to change any of the existing allotment- and permit-level decisions that protect federally-listed species in the revised LMP. The revised LMP does not change the status of allotments across the Inyo NF. Any proposed changes in allotment status would require site-specific analysis to change the Allotment Management Plan.

Recreation Management

Recreation Management includes such activities as the development, operation, and maintenance of developed recreation areas and management of dispersed recreation. Developed recreation includes the development, operation, and maintenance of facilities such as family and group campgrounds, day use (picnic) areas, trailheads, snow parks (snow-cleared parking lots), visitor centers or visitor information sites, corrals, boat ramps, pastures, and developed ski areas.

In limited instances, the USFS may use rodenticides for vector control in campgrounds, plantations, and in and around facilities. The USFS may also use site-specific insecticides related to specific pests under guidance from its Forest Pest Management staff (D. Yasuda, U.S. Forest Service, *in litt.* 2018).

Dispersed recreation includes camping, picnicking, hiking, and other recreation uses that occur outside of developed recreation sites. These uses are allowed anywhere on National Forest System lands unless specifically prohibited, although most use occurs along designated system roads and near lakes, streams, and other water bodies. Some dispersed use locations have a low to moderate density of users. The USFS generally does not provide amenities and facilities like restrooms, water, or trash collection for dispersed recreation. In these instances, the USFS promotes “Leave No Trace” principles that focus on minimizing impacts to the environment including the proper disposal of waste.

Typical management activities include routine operation and maintenance to protect and preserve facilities and minor reconstruction to replace or rehabilitate damaged or outdated facilities. Additionally, activities described above for Vegetation and Fuels Management may occur in developed recreation areas. For example, the USFS routinely fells and/or removes dead or dying trees and hazard trees within falling distance of administrative facilities and within developed sites for public safety. The USFS may conduct some fuels reduction activities around facilities by cutting smaller vegetation, chipping it, piling and burning it, or otherwise removing it from the area.

Substantial recreation use occurs along popular trails, including some trails in designated Wilderness. The USFS also allows off-highway vehicle use on designated system roads and trails on the Inyo NF. The USFS maintains trails by cutting trees and vegetation for clearance, removing fallen trees or obstacles, and clearing, rebuilding, and adjusting trail treads. The USFS also uses Wilderness and special use permits to manage recreation. Wilderness permits help manage the number of visitors, intensity of use, and Wilderness experience. Special use permits help manage individual packstock use and commercial outfitter-guide services. Special use permits also apply to use of sites, scheduled events, and other activities that occur on the Inyo NF.

The revised LMP includes a three-zone approach for recreation management. The three zones are: Destination Recreation Area, Challenging Backroad Recreation Area, and General Recreation Area. The Destination Recreation Area has the most intensive recreational development to meet high demand around well-known attractions and iconic destinations such as the Mammoth Lakes Basin and Whitney Portal. The Challenging Backroad Recreation Area includes largely undeveloped landscapes that have few amenities, low visitor use, and limited management making them suited to dispersed recreation uses. The remainder of the non-Wilderness area is in the General Recreation Area where the USFS manages for multiple-uses.

The intent of the three-zone approach is to manage recreation outside of designated or recommended wilderness areas, and it replaces the current LMP's management prescription approach. This three-zone management approach spans a continuum from areas of more concentrated recreation to areas of remote, less-concentrated, low density recreation. Within these zones, the Inyo NF would manage landscapes for sustainable, balanced, multiple uses rather than for specific sites or places for specific types of use. This approach also focuses management where it is most needed, as well as manages recreation differently from one place to another, based on a zone's particular resource needs.

The USFS recognizes that there will be increased recreation demand in the future and provides clearer direction in the revised LMP on how to manage future recreation demand sustainably within the capability of the action area. The revised LMP also emphasizes partnerships as a means of increasing capacity to provide quality recreation opportunities, as well as more opportunities for interpretive services for public awareness of natural resources and human impacts.

Restoration Activities

The following section broadly describes restoration activities that could occur on the Inyo NF, but the USFS does not have a program that specifically focuses on restoration. The revised LMP includes an increased emphasis on the restoration of degraded ecosystems to improve their resiliency and sustainability. A major emphasis is placed on managing vegetation and fuels in strategic locations in order to increase the potential to conduct larger prescribed burns and to manage some wildfires to meet resource objectives as discussed above for Fire Management and Vegetation and Fuels Management. Additional emphasis is placed on restoring degraded watersheds and aquatic systems, managing and restoring sagebrush (*Artemisia* spp.) and pinyon-juniper (*Pinus* spp.-*Juniperus* spp.) habitats for the Bi-State population of sage grouse (Bi-State sage grouse; *Centrocercus urophasianus*), which is currently not State or federally-listed, and treating and eradicating nonnative and invasive species.

Watershed management and restoration is the art and science of protecting, maintaining, and enhancing soil, water, riparian vegetation, and geologic resources for the multiple beneficial uses that depend upon adequate water quality and quantity. Activities could include ecological restoration of meadow, lake, and stream habitats, improving road drainage and stream crossings, decommissioning unneeded roads, and revegetation of damaged habitats. Within the revised

LMP, the USFS focuses on aquatic restoration in Priority Watersheds and improving and retaining watershed conditions within the Conservation Watersheds. The USFS would identify Priority Watersheds during the Watershed Condition Framework process.

Invasive species management would include activities that detect, prevent, control, and eradicate invasive species. Activities would include surveying for early detection, monitoring known occurrences, and treating or retreating occurrences. Invasive plant removal would include manual removal and the use of select herbicides using focused ground-based application methods. The management of nonnative animals involves the removal of invasive aquatic mussels and snails and certain nonnative fish. These activities generally do not result in ground disturbance but would occur through inspection and cleaning, manual removal, trapping, electroshocking, or other techniques as described in the USFS Manual for Pesticide-Use Management and Coordination (USFS 2013).

Roads and Other Infrastructure

The USFS operates and maintains a system of roads, infrastructure, or facilities that could include: buildings, camps, towers, pipelines, stream gauging stations, water storage and conveyance facilities, or other permanent or semi-permanent structures and infrastructure. The private sector may also operate facilities on National Forest System lands through easements or special use authorizations. Examples of these third-party facilities include work and organizational camps, electronic and communication sites, public water and sanitation systems, power transmission lines, pipelines, research equipment and structures, and access routes to private land in-holdings.

The activities associated with the operation and maintenance of roads and other infrastructure do not occur under a specific program but, for consultation purposes, include those projects that may affect federally-listed species and their habitats (including designated critical habitat). These activities could include surface maintenance, reconstruction of the road base and surface, maintenance, replacement, or improvement of stream crossings and culverts, management of road drainages, clearing roadside vegetation, and stabilizing slopes. Additionally, as described under the previous programs above, the USFS would remove dead, dying, and hazardous trees along roads and near facilities and other infrastructure such as utility lines.

Programmatic Conservation Measures

The BA includes both required and optional plan components. Much of the language that follows is specific to the six programs/activities described in the BA. However, the revised LMP includes numerous required and optional plan components that apply to other programs/activities not addressed in this BO. These required and optional plan components may also avoid and minimize effects to federally-listed species and their habitats (including critical habitat).

The Service has included those plan components that either place constraints on USFS projects or activities (*i.e.*, standards and guidelines) or provide clear direction on how to manage certain areas for the benefit of federally-listed species. The other plan components (desired conditions, objectives, and goals) are broadly defined and do not specifically identify how a program/activity will avoid or minimize effects to federally-listed species or their habitats (including critical

habitat). The Service recognizes that the USFS will tailor these standards and guidelines based on site-specific information at the project-level, include other measures as needed, and may also incorporate best management practices.

The following standards and guidelines in the revised LMP contain a specific coding system (AAA-BBB-CCC) to identify plan components and where they apply. For example, the series of letters before the first dash (AAA) references either a resource area or a type of spatial area. The middle series of letters (BBB) reference where the plan components apply, land of specific character (*e.g.*, subalpine and alpine zones), or mapped parcels of land. The third series of letters (CCC) references the type of plan components. The Service made minor changes to the wording of some of the standards and guidelines to clarify intent and ensure consistency throughout the BO. The Service has noted where the numbering of each of the standards and guidelines differ in the BO from the BA.

Forestwide Direction for Animal and Plant Species

The BA describes measures that focus on the USFS proposed direction to maintain the diversity of plant and animal communities and support the persistence of native species within the plan area subject to the extent of the USFS's authority and the inherent capability of the plan area. For each species or group of species, the revised LMP considers the extent that ecosystem-level plan components provide for ecosystem integrity and diversity to meet the ecological conditions necessary for those species within their range. The USFS added species-specific plan components as needed. The Terrestrial Ecosystems and Vegetation section provides additional direction for special habitats to address the unique habitats of some at-risk species.

Standards (SPEC-FW-STD)¹

1. Design features, mitigation, and project timing considerations are incorporated into projects that may affect occupied habitat for at-risk species.

Guidelines (SPEC-FW-GDL)²

1. Habitat management objectives and non-habitat recovery actions from approved recovery plans should be incorporated, if appropriate, in the design of projects that will occur within federally-listed species habitat to contribute to recovery of the species (#3 in BA).
2. Habitat management objectives or goals from approved conservation strategies or agreements should be incorporated, if appropriate, in the design of projects that will occur within at-risk species habitat (#4 in BA).

Water developments (such as a diversion or well) should be avoided near streams or seeps and springs where there is high risk of dewatering aquatic and riparian habitats where at-risk species occur (#5 in BA).

¹ STD is a standard.

² GDL is a guideline.

Forestwide Direction for Invasive Species

The following measures focus on reducing populations of invasive species (plants, animals, invertebrates and fungi) and minimizing their impacts on native species and ecosystems.

Standards (INV-FW-STD)

1. When working in waterbodies with known aquatic invasive species, clean equipment and vehicles before moving to other waterbodies.
2. Select weed-free plant material for seeding and revegetation projects to reduce the risk of introducing noxious weeds to the disturbed area.
3. Use an integrated pest management approach in the planning and implementation of all projects and activities.

Guidelines (INV-FW-GDL)

1. Projects should be designed to minimize invasive species spread by incorporating prevention and control measures into ongoing management or maintenance activities that involve ground disturbance, terrestrial or aquatic habitat alteration, or the possibility of spreading invasive species. When feasible, projects should include measures to use invasive species-free gravel, fill, and topsoil; include follow-up inspections as needed and specified in regional or national strategies.
2. Hay, straw and other crop-related forage or mulch products used for animal feed or bedding, soil stabilization and land rehabilitation, or other purposes should be certified by California or Nevada or the North American Invasive Species Management Association standards as being weed-free to prevent unintentional introduction of invasive species. Deviations from this guideline may be approved on a case-by-case basis when certified weed-free material is not reasonably available, in consultation with the Inyo National Forest Invasive Species Coordinator.
3. To the extent feasible, plant and seed materials used for revegetation, restoration, and rehabilitation projects should be native, genetically appropriate to the site, and capable of becoming established to restore natural species composition and ecosystem function.
4. Weed control and prevention measures should be included as necessary when issuing, amending or reissuing permits, including but not limited to livestock grazing, special uses, and packstock operator permits.
5. Vegetation management projects on lands outside of Wilderness should include measures to minimize the risk of introducing nonnative invasive species into Wilderness.

Forestwide Direction for Fire

The following measures focus on forestwide fire management, including reducing damages and enhancing benefits from wildland fire. Other plan direction related to fire management is provided for each “Strategic Fire Management Zones” management areas (MA-CWPZ; MA-GWPZ; MA-WRZ; MA-WMZ).

Standards (FIRE-FW-STD)

1. If fire management actions are required within designated Wilderness areas, research natural areas, the Ancient Bristlecone Pine Forest, or the Pacific Crest National Scenic Trail (#2 in BA):
 - a. Apply minimum impact strategies and tactics to manage wildland fire, unless more direct attack is needed to protect people or adjacent property.
 - b. When possible, allow naturally ignited wildfires to function in their natural role.
 - c. In cases where fire may damage the ecological values for which a research natural area was established, measures should be taken to exclude fire from the research natural area.

Guidelines (FIRE-FW-GDL)

1. Use naturally-ignited and prescribed wildland fires to meet multiple resource management objectives, where and when conditions permit and risk is within acceptable limits.
2. When managing wildland fire (wildfire and prescribed fire), use a variety of fire management options, including hand and aerial ignitions, to achieve a mix of fire effects. When safe and feasible, limit extensive continuous areas of high-severity fire effects in old forest habitat.
3. When managing wildland fire, allow fire to burn in riparian ecosystems when fire effects are expected to be within the natural range for the ecosystem to improve riparian ecosystem function (#4 in BA).
4. Where possible during wildland fire management activities, locate incident bases, camps, helibases, staging areas, helispots and other centers for incident activities outside of riparian conservation areas to avoid impacts to aquatic- and riparian-dependent resources (#5 in BA).
5. During wildfires, avoid fire management activities in special habitats (see the Terrestrial section, Chapter 2 in USFS 2018) except when necessary to protect life and property. This includes activities such as line construction, staging areas, safety zones, water drafting and camps. When conducting fire management activities near special habitats, take extra measures to avoid spread of invasive plants (#6 in BA).

Direction for Wildfire Restoration Zone

The wildfire restoration zone identifies where conditions currently put some natural resource values at moderate risk of damage from wildfire. In general, wildfires that start in this zone pose a low to moderate threat to communities in average fire season conditions. Wildfires that burn in this zone can potentially benefit natural resources, but only under limited environmental conditions. Managing wildfires to meet resource objectives in this zone can be constrained due to fuel conditions and moderate risk to natural resources from wildfire. This zone is where some ecological restoration may be needed before using wildland fire under a wider range of weather, fuel moisture, and other environmental conditions.

Standards (MA-WRZ-STD)

1. Use natural barriers and features like creeks, old fire footprints, ridges, and human-made features (such as roads and trails) when managing wildfires to meet resource objectives or managing unwanted wildfires that have surpassed the initial attack phase, unless unsafe, or impractical. Heavy equipment use may be limited due to resource and safety concerns. Variation from this standard due to safety or practicality concerns will be documented by the responsible line officer in the current fire decision support system.

Direction for Wildfire Maintenance Zone

The wildfire maintenance zone encompasses areas where wildfire poses a low threat to communities in average fire season conditions and where conditions allow natural resources to benefit from wildland fire. Managing wildfire to meet resource objectives in this zone is the least constrained, and implementing prescribed fire for ecological restoration is favorable. Ecological maintenance can be carried out by the management of wildland fire under a wide range of weather, fuel moisture, and other environmental conditions. Using prescribed fire to meet resource objectives is also appropriate.

Standards (MA-WMZ-STD)

1. Following current wildland fire policy, manage wildfires to meet resource objectives and restore and maintain fire as an ecological process. The responsible line officer must use the current decision support system for wildfire management to document cases when naturally caused wildfires are promptly suppressed.
2. Use natural barriers and features, such as creeks, old fire footprints, ridges, and man-made lines, such as roads and trails, when managing wildfires to meet resource objectives or unwanted wildfires that have surpassed the initial attack phase, unless unsafe or impractical. Variation from this standard due to safety or practicality concerns will be documented by the responsible line officer in the current fire decision support system.

Direction for Rangeland Livestock Grazing

The following standards and guidelines apply to rangeland management, which includes the authorized use and management of National Forest System lands for the purpose of livestock production and utilization of forage resources by livestock. Additional direction in the sections “Animal and Plant Species,” “Wilderness” (packstock), and “Riparian Conservation Areas” also applies to this program.

Rangeland utilization is determined for different vegetation types based on similarity to desired vegetation condition and hydrologic function at grazing key areas. Allowable utilization can differ between the grazing systems being implemented. The standards and guidelines for rangeland utilization are organized by the grazing systems potentially used within each vegetation type. After this initial allowable utilization standard is determined based on vegetation conditions, they are adjusted based on watershed conditions.

Standards (RANG-FW-STD)

1. New livestock handling facilities and stock driveways, salting, and supplemental feeding are prohibited in meadow and riparian locations. Placement must be consistent with meeting watershed or water quality best management practices if located in riparian conservation areas (#4 in BA).
2. If the results of rangeland condition evaluations indicate the grazing key area is less than fully functional, use an interdisciplinary team to incorporate corrective actions that address specific on-the-ground problems. There may be more than one corrective action needed to achieve a trend towards fully functional watershed condition. No adjustments are needed if the results of a rangeland condition assessment indicate that the grazing key area is fully functional and there are no off-site factors that need to be addressed (#5 in BA).
3. Within riparian conservation areas that are properly functioning or functioning-at-risk with an upward trend, limit annual livestock disturbance to streambanks and shorelines of natural lakes and ponds (caused by trampling and trailing) from exceeding 20 percent of the stream reach, or natural lake and pond shorelines. Disturbance includes bank sloughing, chiseling, trampling, and other means of exposing bare soil or cutting plant roots. Allow no more than 15 to 20 percent disturbance if the riparian conservation area is functioning-at-risk with a downward trend, as defined in the appropriate technical reports (#7 in BA).

Guidelines (RANG-FW-GDL)

1. If recovery of desired vegetation conditions and related biophysical resources are necessary in recently burned areas, then rest from livestock grazing.

Direction for Sustainable Recreation

The following standards and guidelines apply to forestwide recreation. The other standards and guidelines that follow also describes recreation management areas that provide management direction for particular recreation experiences and activities in Sustainable Recreation Management Zones.

Guidelines (REC-FW-GDL)

1. Avoid locating new recreation facilities within environmentally and culturally sensitive areas, such as at-risk species breeding habitat or at-risk plant species habitat.
2. Use integrated resource planning when designing projects to address impacts to at-risk species habitat and changing conditions in recreation settings (#3 in BA).

Direction for Designated Wilderness

Individual Wilderness plans provide Wilderness area-specific guidance in addition to the strategic-level guidance provided in the revised LMP.

Guidelines (DA-WILD-GDL)

1. Limit party size and number of stock per party to a level that protects social and natural resource values. The level may vary within or between Wilderness areas.

Standards (MA-EWSR-STD)

1. For interim management of Forest Service-identified eligible or recommended suitable rivers, use interim protection measures identified in FSH 1909.12–84.3 (USFS 2015).

Species-Specific Direction for Bighorn Sheep

Desired Conditions (SPEC-SHP-DC)

1. The risk of disease transmission from domestic sheep and goats, including pack goats, to bighorn sheep (based upon the best available risk model) is reduced to the maximum extent practicable.

Standards (SPEC-SHP-STD)

1. Do not allow domestic sheep or goat grazing or pack goat use where relevant bighorn sheep risk assessment models show there is a high risk of contact and spread of disease, unless risks can be adequately mitigated.
2. Manage recreation, or other disturbances, where research has found it to cause SNBS to avoid important habitat as described in the SNBS Recovery Plan or other guidance from the Service.

Suitability (SPEC-SHP-SUIT)

1. Domestic sheep or goats, including pack goats, are not suitable within the high risk area for disease transmission to SNBS identified in the most recent bighorn sheep risk assessment.

Aquatic Ecosystems and Species

The revised LMP includes a broader and more comprehensive approach to aquatic habitat conservation. It strengthens and replaces the approach using small, isolated critical aquatic refuges (CARs) and independently identified priority watersheds with an approach centered on larger conservation watersheds and a more integrated prioritization of watershed restoration opportunities. It retains but clarifies direction applied to riparian conservation areas.

Forestwide Components for Watersheds

Plan components for Watersheds (WTR) cover the broad area of soils and water throughout the Inyo NF at the watershed scale. Watersheds include riparian conservation areas and the riparian and aquatic environments contained within them, such as rivers, streams, meadows, springs, and seeps. Figure 3 shows the relationship among watersheds, riparian conservation areas, and

riparian and aquatic environments. Conservation watersheds are a specific subset of watersheds selected by National Forest managers to provide for continued high-quality water sources and the long-term persistence of at-risk species.

The USFS's uses a national Watershed Condition Framework to identify priority watersheds for restoration. Priority watersheds are where the revised LMP objectives for restoration would concentrate on maintaining or improving watershed condition. Under the framework, the Forest Supervisor is responsible for identifying priority watersheds using an interdisciplinary team process. The list of priority watersheds can be changed administratively without an amendment to the LMP.

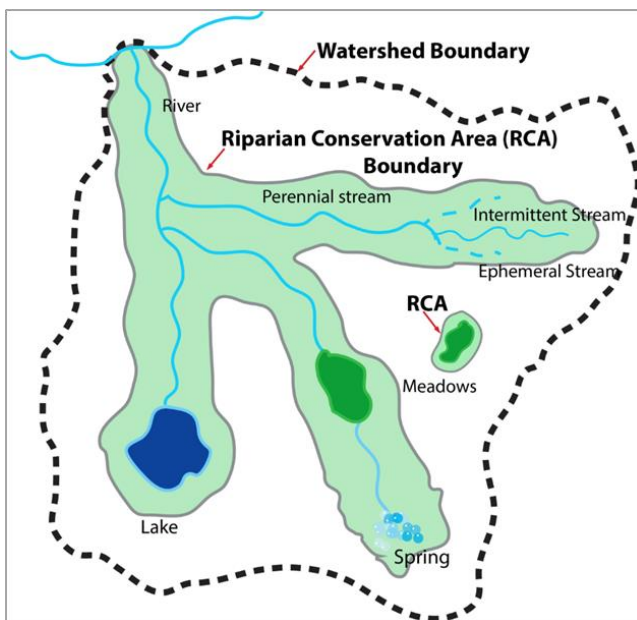


Figure 3. A schematic of the relationship of watersheds, riparian conservation areas, and riparian and aquatic environments (USFS 2017).

Standards (WTR-FW-STD)

1. Use best management practices as described in agency technical guides and handbooks to mitigate adverse impacts to soil and water resources during the planning and implementation of forest activities.
2. Restoration projects will not result in long-term degradation of aquatic and riparian conditions, including connectivity, at the watershed or subwatershed scale. Adverse effects from project activities are acceptable when they are short-term, site-scale, and support or do not diminish long-term recovery of aquatic and riparian resources.

3. For exempt hydroelectric facilities on National Forest System lands, ensure that special use permit language provides adequate instream flow requirements to maintain, restore, or recover favorable ecological conditions for local riparian- and aquatic-dependent species.
4. After restoration actions, including soil disturbance or seeding activities, avoid subsequent soil-disturbing management activities until project objectives have been met, unless a resource team determines that disturbance will help achieve project objectives.

Management Area Components for Conservation Watersheds

Conservation watersheds are identified as a network of watersheds that have been determined to have a functioning or functioning-at-risk rating based on the Watershed Condition Framework, provide for connectivity of species of conservation concern, and provide high quality water for beneficial uses downstream. The management emphasis for conservation watersheds is to maintain or improve, where possible, the functional rating of these systems for the long term and to provide for persistence of species of conservation concern by maintaining connectivity and refugia for these species. The intent of plan direction in conservation watersheds is to focus restoration and monitoring over the long term, while still allowing for other resource uses or activities within these areas.

Guidelines (MA-CW-GDL)

1. Accept adverse effects from project activities when they are short-term, site-specific, and support the long-term functionality of aquatic, riparian, and terrestrial systems.
2. Design project activities in conservation watersheds to attain functional Watershed Condition Framework indicators.
3. When building new roads within conservation watersheds, avoid or minimize increases in sediment production; increases in water capture; and loss of stream connectivity unless these actions increase the benefit of ecological function in aquatic ecosystems.

Management Area Components for Riparian Conservation Areas

Riparian conservation area widths are defined by type:

- Perennial streams, 300 feet (ft) on each side of the stream, measured from the bankfull edge of the stream;
- Seasonally flowing streams (includes intermittent and ephemeral streams), 150 ft on each side of the stream, measured from the bankfull edge of the stream;
- Streams in inner gorge (defined by stream adjacent slopes greater than 70 percent gradient), top of inner gorge;
- Special aquatic features (including lakes, wet meadows, bogs, fens, wetlands, vernal pools, and springs) or perennial streams with riparian conditions extending more than 150 ft from edge of streambank or seasonally-flowing streams with riparian conditions extending more than 50 ft from edge of streambank, 300 ft from edge of feature or riparian vegetation, whichever width is greater; and
- Other hydrological or topographic depressions without a defined channel, riparian conservation area width, and protection measures determined through project-level analysis.

Riparian conservation area widths may be adjusted at the project level if interdisciplinary analysis demonstrates a need for different widths to meet or improve riparian conservation area desired conditions. Riparian conservation area plan components apply to the entire riparian conservation areas, as well as the specific riparian and aquatic environments contained within them, such as rivers, streams, meadows, springs and seeps. Riparian and aquatic environments also have additional direction specific to each environment.

Plan Components for All Riparian Conservation Areas

Standards (MA-RCA-STD)

1. Ensure that management activities do not adversely affect water temperatures necessary for local aquatic- and riparian-dependent species assemblages.
2. Limit pesticide applications to cases where project-level analysis indicates that pesticide applications are consistent with riparian conservation areas desired conditions.
3. Prohibit storage of fuels and other toxic materials except at designated administrative sites and sites covered by special use authorization. Prohibit refueling within riparian conservation areas except if there are no other alternatives.
4. Ensure that culverts or other stream crossings do not create barriers to upstream or downstream passage for aquatic-dependent species, except where desired to protect native species.
5. All new or replaced permanent stream crossings shall accommodate at least the 100-year flood, its bedload, and debris. Estimates for 100-year flood potential will reflect the best available science regarding potential effects of climate change.
6. Locate water drafting sites to minimize adverse effects to instream flows and depletion of pool habitat.
7. Prevent disturbance to streambanks and shorelines of natural lakes and ponds (caused by resource management activities, or factors such as off-highway vehicles or dispersed recreation) from exceeding 20 percent of stream reach, or 20 percent of natural lake and pond shorelines. Disturbance includes bank sloughing, chiseling, trampling, and other means of exposing bare soil or cutting plant roots. This standard may not be met within Destination Recreation Management Areas; sites authorized under special use permits; and designated off-highway vehicle routes, but activities will be designed and managed to reduce the percent of impact to the extent feasible.
8. In fen ecosystems, limit disturbance from livestock and packstock to no more than 15 to 20 percent annually. Reduce disturbance further if a fen is nonfunctioning or functioning-at-risk with a downward trend.
9. Use screening devices for water drafting pumps. Fire suppression activities are exempt during initial attack. Use pumps with low entry velocity to minimize removal of aquatic species from aquatic habitats, including juvenile fish, amphibian egg masses and tadpoles.
10. Prohibit or mitigate ground-disturbing activities that adversely affect hydrologic processes that maintain water flow, water quality, or water temperature critical to sustaining fen ecosystems and the plant species that depend on these ecosystems.
11. Prevent activities from causing significant degradation of fens from trampling, such as by livestock, packstock, wheeled vehicles, and humans.
12. Manage livestock grazing to attain desired conditions in riparian conservation areas. Where livestock grazing is found to be contributing to a decline in the function of riparian systems,

modify grazing practices as prescribed in the Inyo Forest Supplement to the R5 Rangeland Analysis and Planning Guide (USFS 1997). If adjusting practices is not effective, remove livestock from that area using appropriate administrative authorities and procedures.

13. Assess the hydrologic function of riparian areas, meadows, fens, and other special aquatic features during rangeland management analysis. Ensure that characteristics of special features are, at a minimum, at proper functioning condition or functioning-at-risk (USFS 1997) and trending toward proper functioning condition, as defined in appropriate technical reports (BLM 2003). If systems are functioning-at-risk, assess appropriate actions to move towards proper functioning condition.
14. Complete initial inventories of fens within active grazing allotments prior to completing the allotment environmental analysis. If more than 10 fens occur on an allotment, ensure at least 25 percent of all fens are inventoried initially. Establish a 5-year schedule to complete inventory.
15. Designate equipment exclusion zones within riparian conservation areas when designing projects. The default is half of the riparian conservation area width (150 ft for perennial streams, 75 ft for intermittent streams):
 - a. These widths may be adjusted on a project-by-project basis based on geomorphology, slope, or soil conditions, as long as best management practices and other plan direction are met. Adjustments may be made only after consultation with experts in aquatic ecology, soils, and/or hydrology.

If further mechanical incursion is warranted, use methods that limit soil disturbance within the riparian conservation area, such as low ground pressure equipment, helicopters, over-the-snow logging, extra ground cover requirements, or other soil protective actions to achieve desired conditions consistent with best management practices and other plan direction.

- b. When vegetation is treated in the near stream area, meet the needs for coarse wood in stream channels where possible.
16. Locate new livestock handling facilities and stock driveways, salting, and supplemental feeding outside of meadows and riparian areas except where there are no other feasible alternatives and where placement is consistent with meeting watershed or water quality best management practices if located in riparian conservation areas (#17 in BA).
17. Avoid construction of new skid trails or temporary roads for access into riparian conservation areas, unless it is the only feasible option to conduct restoration activities for protection and improvement of riparian conservation areas (#18 in BA).
18. Ensure that post-wildfire management activities enhance native vegetation cover, stabilize channels, and minimize adverse effects from the existing road network to protect the riparian systems (#19 in BA).

Guidelines (MA-RCA-GDL)

1. Maintain and restore the hydrologic connectivity of streams, meadows, wetlands, and other special aquatic features by identifying roads and trails that intercept, divert, or disrupt natural surface and subsurface water flow paths. Implement corrective actions where necessary to restore connectivity.
2. Minimize impacts from roads, trails, off-highway vehicle trails and staging areas, developed recreation sites, dispersed campgrounds, special use permits, grazing permits, and day use sites that have been identified as contributing to degradation of water quality or habitat for aquatic and riparian-dependent species.
3. During permit reissuance for livestock, evaluate impacts of facilities on the riparian conservation areas and consider relocating existing livestock facilities outside of meadows and riparian areas.
4. Avoid wildfire control methods and activities that would impact the riparian conservation area, including dozer-built lines, unless alternative control methods are not safe or practical.
5. Stream reaches of all State-designated wild trout waters (designated as of February 2001) should be managed according to the following: any activity that results in trampling and chiseling should not exceed 10 percent of any given stream reach in order to reduce sedimentation into wild trout waters. A reach is defined as a continuous portion of a stream with homogeneous physical characteristics.
6. Unstable or eroding streambanks should be restored to attain a streambank system that is no more than 10 percent unstable of the reaches current potential.
7. To prevent impacts to spawning habitat, stream-modifying construction activities within or immediately adjacent to the aquatic zone should be prohibited during the following spawning seasons:
 - a. In streams with spring spawning species [rainbow trout (*Oncorhynchus mykiss*), cutthroat trout (*Oncorhynchus clarkii*), and golden trout (*Oncorhynchus mykiss aguabonita*)], February 15 to August 20.
 - b. In streams with fall spawning species [brown trout (*Salmo trutta*) and brook trout (*Salvelinus fontinalis*)], October 1 to April 15.

The Forest Supervisor has the authority to make exceptions to these seasons.

Species-Specific Direction for Lahontan Cutthroat Trout

Standard (SPEC-LCT-STD)

1. In stream reaches occupied by or identified as essential habitat in the recovery plan for the LCT, limit streambank disturbance from livestock to 10 percent of the occupied or essential habitat stream reach. Take corrective action where streambank disturbance limits have been exceeded.

Species-Specific Direction for Paiute Cutthroat Trout

Standard (SPEC-PCTR-STD)

1. In stream reaches occupied by or identified as essential habitat in the recovery plan for the PCT, limit streambank disturbance from livestock to 10 percent of the occupied or “essential habitat” stream reach. Take corrective action where streambank disturbance limits have been exceeded.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY DETERMINATION

Section 7(a)(2) of the ESA requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species. “Jeopardize the continued existence of” means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR § 402.02).

The jeopardy analysis in this BO considers the effects of the proposed Federal action, and any cumulative effects, on the rangewide survival and recovery of the listed species. It relies on four components: (1) The Status of the Species, which describes the rangewide condition of the species, the factors responsible for that condition, and its survival and recovery needs; (2) the Environmental Baseline, which analyzes the condition of the species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species; (3) the Effects of the Action, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the species; and (4) the Cumulative Effects, which evaluates the effects of future, non-Federal activities in the action area on the species.

ANALYTICAL FRAMEWORK FOR THE DESTRUCTION OR ADVERSE MODIFICATION DETERMINATION

Section 7(a)(2) of the ESA requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to destroy or to adversely modify designated critical habitat. A final rule revising the regulatory definition of “destruction or adverse modification” was published on February 11, 2016 (Service 2016a). The final rule became effective on March 14, 2016. The revised definition states:

“Destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features.”

The “destruction or adverse modification” analysis in this BO relies on four components: (1) The Status of Critical Habitat, which describes the rangewide condition of the critical habitat in terms of the key components (*i.e.*, essential habitat features, primary constituent elements, or physical and biological features) that provide for the conservation of the listed species, the factors responsible for that condition, and the intended value of the critical habitat overall for the conservation/recovery of the listed species; (2) the Environmental Baseline, which analyzes the condition of the critical habitat in the action area, the factors responsible for that condition, and the value of the critical habitat in the action area for the conservation/recovery of the listed species; (3) the Effects of the Action, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated and interdependent activities on the key components of critical habitat that provide for the conservation of the listed species, and how those impacts are likely to influence the conservation value of the affected critical habitat; and (4) the Cumulative Effects, which evaluate the effects of future non-Federal activities that are reasonably certain to occur in the action area on the key components of critical habitat that provide for the conservation of the listed species and how those impacts are likely to influence the conservation value of the affected critical habitat.

For purposes of making the “destruction or adverse modification” determination, the Service evaluates if the effects of the proposed Federal action, taken together with cumulative effects, are likely to impair or preclude the capacity of critical habitat in the action area to serve its intended conservation function to an extent that appreciably diminishes the rangewide value of critical habitat for the conservation of the listed species. The key to making that finding is understanding the value (*i.e.*, the role) of the critical habitat in the action area for the conservation/recovery of the listed species based on the Environmental Baseline analysis.

A final rule published on February 11, 2016 (81 FR 7414), removed the phrase “primary constituent elements” (PCEs) from the regulations for designating critical habitat (50 CFR 424.12). Instead, new designations will focus on “physical and biological features” (PBFs). Existing critical habitat rules may still define PCEs; however, the terms (PBFs and PCEs) may be used interchangeably as they are considered synonymous. In cases where an existing critical habitat rule numbers PCEs specifically (*e.g.*, PCE-1, PCE #1), we will use the terms as defined in the existing critical habitat definition to avoid confusion.

Lahontan Cutthroat Trout (rangewide)

Lahontan cutthroat trout were listed by the Service on October 13, 1970, as endangered under the Endangered Species Protection Act of 1969 (Service 1970) and subsequently reclassified as threatened on July 16, 1975, under the ESA, to facilitate management (Service 1975). Critical habitat has not been designated for LCT.

Cutthroat trout have the most extensive range of any inland trout species of western North America and occur in anadromous, non-anadromous, fluvial, and lacustrine populations (Behnke 1992). Differentiation of the species into approximately 14 recognized subspecies occurred during subsequent general desiccation and isolation of the Great Basin and Inter-mountain

Regions since the end of the Pleistocene, and indicates presence of cutthroat trout in most of their historic range prior to the last major Pleistocene glacial advance (Loudenslager and Gall 1980, Behnke 1992).

The LCT is endemic to the Lahontan Basin of northern Nevada, eastern California, and southeastern Oregon. Historically, LCT occupied large freshwater and alkaline lakes, small mountain streams and lakes, small tributary streams, and major rivers including the Truckee, Carson, Walker, Susan, Humboldt, Quinn, Summit Lake/Black Rock Desert, and Coyote Lake watersheds (Service 1995). Large lakes included Lake Tahoe, Fallen Leaf Lake, and Cascade Lake in the Tahoe watershed; Donner Lake, Independence Lake, Winnemucca Lake (now dry), and Pyramid Lake in the Truckee River watershed; Walker Lake in the Walker River watershed; and Summit Lake in the Black Rock Desert watershed (Gerstung 1988). Other headwater lakes found in the Walker River watershed were also historically occupied (Gerstung 1988).

Lahontan cutthroat trout currently occupy approximately 587.7 miles (mi), or 8.6 percent of streams within their historical range. Lahontan cutthroat trout occupy an additional 52.7 mi of habitat outside their historical range (Out-of-Basin) for a total of 640.1 mi of occupied stream habitat. Seventy-two conservation populations were identified based on May and Albeke (2008), which represent 74.0 percent (475.0 mi) of the currently occupied habitat.

Lahontan cutthroat trout occupy five of their historical lakes which constitute 46.8 percent of their historical lake habitat. However, only two lakes have self-sustaining populations, which comprises less than 1.0 percent of the historical lake habitat. All other lake populations within the Western Lahontan Basin are completely maintained by Federal, State, and Tribal hatchery stocking programs. Lahontan cutthroat trout are also stocked into many other lakes outside their historical range for recreational purposes.

The range of LCT is divided into three Geographic Management Units (GMUs) based on geographical, ecological, behavioral, and genetic factors, and has been managed as such since 1995. These three GMUs are: (1) Western Lahontan Basin comprised of the Truckee, Carson, and Walker River watersheds; (2) Northwestern Lahontan Basin comprised of the Quinn River, Black Rock Desert, and Coyote Lake watersheds; and (3) Eastern Lahontan Basin comprised of the Humboldt River and tributaries.

Relevant information on the status of LCT, life history traits, population dynamics, habitat requirements, threats, and historical and current distribution can be found in the LCT Recovery Plan (Service 1995), Short Term Action Plans for the Truckee and Walker River Basins (Service 2003a, b), and the LCT 5-year Review (Service 2009a). A brief summary of our findings in the 5-year Review is presented below.

In the LCT 5-year Review (Service 2009a), the current range of the species was mapped and assessed by treating each occupied LCT stream as an individual mapping segment (May and Albeke 2008). Specific information relative to stocking records, presence of nonnative fish, LCT density, habitat quality, and relative stream width were collected for each mapping segment (May and Albeke 2008). In the 5-year Review, mapping segments were aggregated into

conservation populations according to specific criteria; in this BO we continue this practice of distinguishing individual occupied stream reaches (mapping units) from conservation populations.

Lahontan cutthroat trout populations have been and continue to be impacted by nonnative species interactions, habitat fragmentation and isolation, degraded habitat conditions, drought, and fire (Rhymer and Simberloff 1996, Dunham *et al.* 1997, Dunham *et al.* 2002, Fagan 2002, Dunham *et al.* 2003).

Nonnative Salmonids (Competition and Hybridization)

Nonnative fish, especially salmonid species, are currently the greatest threat to LCT rangewide, resulting in loss of available habitat and range constrictions primarily through competition and hybridization. Nonnative fish co-occur with LCT in 36.4 percent of currently occupied stream habitat and all currently occupied historical lake habitat except for Walker Lake (Service 2009a). Most LCT populations which co-occur with nonnative species are decreasing and the majority of populations extirpated since the mid-1990s have been lost as a result of nonnative species. Nonnative fish also occupy habitat in nearly all unoccupied LCT historical stream and lake habitat, making repatriation of LCT to these habitats extremely difficult. The majority of LCT populations are isolated and confined to small habitats (in terms of width) and short stream lengths. These factors reduce gene flow between populations and reduce the ability of populations to recover from catastrophic events, thus threatening their long-term persistence and viability (Frankham 2005). Pyramid and Walker Lakes are important habitat for the lacustrine form of LCT. Conditions in these lakes have deteriorated over the past 100 years and continue to decline, most dramatically in Walker Lake.

Competition from nonnative trout has been identified as one of the most detrimental threats to native inland cutthroat trout (*Oncorhynchus clarkii* spp.) (Gresswell 1988, Behnke 1992, Young 1995). Both abiotic and biotic processes can influence competitive advantages for nonnative trout over native cutthroat trout (Dunham *et al.* 2002, Peterson *et al.* 2004, Shepard 2004, de la Hoz Franco and Budy 2005, Quist and Hubert 2005, Korsu *et al.* 2007, McGrath and Lewis 2007, Budy *et al.* 2008, Seiler and Keeley 2009, Wood and Budy 2009).

Hybridization with nonnative salmonids is a common threat to all native western trout species (Behnke 1992), including LCT (Service 2009a). Nonnative rainbow trout readily hybridize with native cutthroat trout and produce fertile offspring; however, fitness decreases as the proportion of rainbow trout admixture increases (Muhlfeld *et al.* 2009). Even with reduced fitness, hybridization spreads rapidly because the initial F1 (first generation) hybrids have high fitness, hybrids tend to stray more frequently, and all offspring of hybrids are hybrids (Boyer *et al.* 2008, Muhlfeld *et al.* 2009). Extensive genetic mixing of natives, nonnatives, and hybrids contributes to the loss of locally adapted genotypes and can lead to the extirpation of a population or the extinction of an entire species (Leary *et al.* 1995, Rhymer and Simberloff 1996). Isolating populations of native salmonids from nonnative salmonids has become a popular management option; however, barriers can restrict life history traits and isolate populations in small habitats, thereby reducing long-term survival and precluding recolonization if the population is extirpated (Fausch *et al.* 2009).

Population Isolation

Isolated populations are vulnerable to extirpation through demographic stochasticity (random fluctuations in birth and death rates); environmental stochasticity (random variation in environmental attributes) and catastrophes; loss of genetic heterozygosity (genetic diversity) and rare alleles (inherited forms of a genetic trait); and human disturbance (Hedrick and Kalinowski 2000, Lande 2002, Reed and Frankham 2003, Noss *et al.* 2006, Pringle 2006). Completely isolated populations are the most severe form of fragmentation because gene flow among populations does not occur, thereby inflicting inbreeding depression on the population and reducing fitness (Hedrick and Kalinowski 2000, Reed and Frankham 2003, Frankham 2005, Scribner *et al.* 2006, Pritchard *et al.* 2007, Guy *et al.* 2008). Across the entire range of LCT, 72.2 percent (52 populations) of all conservation populations are completely isolated and occur in short (less than 5.0 mi) stream reaches (Service 2009a). While the current populations have maintained their purity, evidence of loss of genetic diversity has been found in LCT populations (Peacock and Kirchoff 2007).

A recent study characterized the population genetic diversity and genetic structure of 40 extant LCT populations, within and among watersheds and within each of the 3 GMUs across the range of LCT (Peacock and Kirchoff 2007). Genetic diversity was greatest in the Eastern GMU, a finding attributed to the number of occupied streams, the size of extant populations, and availability of connected habitat. In contrast, the Northwestern GMU had moderately low genetic diversity due to small isolated populations.

Habitat Availability/Population Size

Several studies have found that population viability of cutthroat trout is correlated with stream length or habitat size (Hilderbrand and Kershner 2000, Harig and Fausch 2002, Young *et al.* 2005). Stream length is important because trout move throughout stream networks searching for a variety of habitats necessary to complete their life cycle (*i.e.*, spawning, rearing, migration corridors, refugium) (Baltz *et al.* 1991, Fausch and Young 1995, Young 1996, Muhlfeld *et al.* 2001, Schmetterling 2001, Hilderbrand and Kershner 2004, Schrank and Rahel 2004, Colyer *et al.* 2005, Neville *et al.* 2006, Umek 2007). Longer stream reaches have more complexity and have a higher probability that no particular habitat type limits the population (Horan *et al.* 2000, Harig and Fausch 2002, Dunham *et al.* 2003, Huusko *et al.* 2007).

The literature suggests that to ensure long-term persistence, cutthroat populations should consist of more than 2,500 individuals, occupy at least 5.0 mi of habitat, and have no nonnative species present (Hilderbrand and Kershner 2000). In streams with smaller population densities (160 fish/mi), the minimum required stream length increased to 15.5 mi. Currently, only 28.2 percent of LCT conservation populations occupy habitat greater than 5 mi in length and over 83.0 percent of currently occupied streams have fewer than 150 LCT/mi.

Land Use Activities

The Service's LCT 5-year Review specifically identified grazing, roads, and mining as land use activities that are occurring within watersheds containing LCT conservation populations (Service 2009a). The Service discusses each of these land use activities in greater detail in the following paragraphs.

Grazing

Impacts of improper livestock grazing to stream habitat and fish populations can be separated into acute and chronic effects. Acute effects are those which contribute to the immediate loss of individuals, loss of specific habitat features (undercut banks, spawning beds, *etc.*) or localized reductions in habitat quality (sedimentation, loss of riparian vegetation, *etc.*). Chronic effects are those which, over a period of time, result in loss or reduction of entire populations of fish, or widespread reduction in habitat quantity and/or quality.

According to Minshall *et al.* (1989), riparian/stream ecosystems are the most threatened ecosystems in the Great Basin. Native and domestic grazers, especially cattle, are attracted to these narrow green strips of vegetation due to the presence of water, shade, succulent vegetation, and gentle topography (Platts 1979, Marlow and Pogacnik 1986, Smith *et al.* 1992, Kie and Boroski 1996, Parsons *et al.* 2003). Livestock grazing can affect riparian areas by changing, reducing, or eliminating vegetation (Schulz and Leininger 1990, Green and Kauffman 1995), and by the actual loss of riparian areas through channel widening (Overton *et al.* 1994), channel degradation, or lowering of the water table (Chaney *et al.* 1990). Effects to fish habitat include reduction of shade and cover and resultant increases in water temperature, changes in stream morphology, and the addition of sediment due to bank degradation and off-site soil erosion (Belsky *et al.* 1999). Behnke and Zarn (1976) identified livestock grazing as the greatest threat to the integrity of stream habitat in the western United States.

Grazing of livestock in Sierra Nevada meadows and riparian areas (rivers, streams, and adjacent upland areas that directly affect them) began in the mid-1700s with the European settlement of California (Menke *et al.* 1996). Following the gold rush of the mid-1800s, grazing increased to a level exceeding the carrying capacity of the available range, causing significant impacts to meadow and riparian ecosystems (Meehan and Platts 1978, Menke *et al.* 1996). By the turn of the 20th century, high Sierra Nevada meadows were converted to summer rangelands for grazing cattle, sheep, horses, goats, and pigs, although the alpine areas were mainly grazed by sheep (Beesley 1996, Menke *et al.* 1996). Stocking rates of both cattle and sheep in Sierra Nevada meadows in the late 19th and early 20th centuries were very heavy (Kosco and Bartolome 1981), and grazing severely degraded many meadows (Ratliff 1985, Menke *et al.* 1996).

Within the newly established National Parks, grazing by cattle and sheep was eliminated, although grazing by packstock, such as horses and mules, continued. Within the National Forests, the amount of livestock grazing was gradually reduced, and the types of animals shifted away from sheep and toward cattle and packstock, with cattle becoming the dominant livestock. During World Wars I and II, increased livestock use occurred on National Forests in the west, causing overuse in the periods 1914 to 1920 and 1939 to 1946. Between 1950 and 1970 livestock numbers were permanently reduced due to allotment closures and uneconomical operations, with

increased emphasis on resource protection and riparian enhancement. Further reductions in livestock use began again in the 1990s, due in part to USFS reductions in permitted livestock numbers, seasons of use, implementation of rest-rotation grazing systems, and to responses to drought (Menke *et al.* 1996). Between 1981 and 1998, livestock numbers on National Forests in the Sierra Nevada decreased from 163,000 to approximately 97,000 head, concurrent with USFS implementation of standards and guidelines for grazing and other resource management (USFS 2001a, b). Historical evidence indicates that heavy livestock use in the Sierra Nevada has resulted in widespread damage to rangelands and riparian systems due to sod destruction in meadows, vegetation destruction, and gully erosion (see review in USFS *et al.* 2014 and in USFS *et al.* 2015).

In the LCT 5-year Review, the Service determined that some level of livestock grazing occurs in 95.0 percent of stream lengths containing LCT conservation populations (64 conservation populations; Service 2009a). All conservation populations located in the Eastern and Northwest GMUs, and 72.0 percent in the Western GMU, were determined to have some level of grazing occurring. During the 5-Year Review, data concerning livestock stocking rates, season of use, or utilization levels was not compiled or analyzed. However, it was determined that only about one-third of conservation populations were protected by riparian fencing, which presumably protects streams and riparian habitat from grazing impacts.

Roads

The ecological effects of roads on aquatic systems and fish are well documented (Forman and Alexander 1998, Spellerberg 1998, Trombulak and Frissell 2000, Gucinski *et al.* 2001, Forman *et al.* 2003, Wheeler *et al.* 2005). Road crossings can create barriers to fish migration (*e.g.*, culverts), effectively isolating populations in headwater reaches (Furniss *et al.* 1991, Warren and Pardew 1998). Roads can affect the hydrology, geomorphology, and disturbance regimes in stream networks (Jones *et al.* 2000). Increases in the frequency and magnitude of flood events have been attributed to roads (Jones *et al.* 2000), which reduce a stream's ability to cope with other large disturbances, and it may not be as resilient as it once was under a normal flow regime. Water, through precipitation or shallow groundwater transport, may be intercepted by roads and rerouted into the stream at road crossings (Wemple *et al.* 1996), which can add to the flood peak and increase sediment delivery to streams (Sugden and Woods 2007). Several studies have found that increasing road densities were clearly associated with declining salmonid populations (Lee *et al.* 1997, Dunham and Rieman 1999). Roads also facilitate movement of vectors for invasive species of plants (Tyser and Worley 1992, Forman *et al.* 2003) and animals (Rahel 2004). Increases in illegal fishing and illegal introductions of nonnative fish and other aquatic organisms are facilitated by public road access to different water bodies (Rahel 2004).

In the LCT 5-year Review, the Service concluded that roads are associated with 65.0 percent of stream lengths containing LCT conservation populations (37 conservation populations) (Service 2009a). We identified stream impacts from roads within 90.0 percent of the conservation populations found in the Northwest GMU, 67.0 percent of the Western GMU, and 51.0 percent in the Eastern GMU.

Mining

The effects of mining on receiving water systems can represent a severe threat to all aquatic organisms in localized situations (Nelson *et al.* 1991). Mining can contribute toxic substances into waterways, alter stream morphology, and dewater streams completely (Nelson *et al.* 1991, Service 2008a). In 2008, the Service published an assessment of trace-metal exposure to aquatic biota from historical mine sites in the western Great Basin (Service 2008a). The study looked at five different streams across the western Great Basin with various levels of mining impacts. The authors found low pH and increased concentrations of certain trace-metals in some streams which pose a significant threat to aquatic biota, increased concentrations of trace-metals in stream sediment, and bioaccumulation of trace-metals in macroinvertebrates and fish.

In our 5-year Review for LCT, it was determined that mining was associated with 16.3 percent of stream lengths containing LCT conservation populations (7 conservation populations) in the Eastern and Northwest GMUs for LCT (Service 2009a).

Drought, Water Diversions, and Water Management

Matthews and Marsh-Matthews (2003) reported the most common drought-related impacts to fish were decreases in numbers at the population and community level, loss of habitat, poor water quality (*i.e.*, hypoxia and temperature), decreased ability for movement, crowding, and desiccation. They also noted that studies of the effects of drought have occurred on a local scale but that large spatial studies incorporating metapopulations dynamics were lacking (Matthews and Marsh-Matthews 2003). Drought related decreases in several LCT populations have been documented (Sevon *et al.* 1999, Neville and DeGraaf 2006, Ray *et al.* 2007).

Small streams (width of 5.0 ft or less) are more susceptible than larger streams to drying, increased stream temperatures during the summer, and freezing during the winter, and stream width is an indicator of these risks (Lake 2003). Approximately 35.0 percent of currently occupied LCT habitats are in streams that are 5.0 ft or less in width. Although not all small streams have equal risk from drought, small headwater streams, especially those with an inadequate number of deep pools, are most likely to lose suitable habitat (Lake 2003). However, functioning small streams with good quality habitat (*e.g.*, deep pools) and limited anthropogenic influences can sustain salmonids during drought conditions (White and Rahel 2008). Since most LCT conservation populations are small and isolated, any reduction in population size due to drought can also reduce genetic diversity and fitness (Rutledge *et al.* 1990, Faber and White 2000).

Lahontan cutthroat trout populations have been severely reduced or even extirpated due to drought-related effects (Service 1995, Dunham 1996, Neville and DeGraaf 2006, Ray *et al.* 2007). The summer of 2015 represented the fourth year of regional drought across most of the historical range of LCT, thus generating conditions that exacerbate threats to LCT. Across the range of the species, some LCT-occupied streams ran dry or were severely curtailed due to the continued drought conditions. Since most populations are isolated, recolonization after extirpation or input of genetic material from other populations cannot occur naturally. The reduction of flow into important terminal lakes (*i.e.*, Pyramid and Walker) is decreasing water

quality and affecting LCT survival. With more frequent and severe droughts likely accompanying climate change, it was concluded that drought is a threat to LCT throughout its range.

Natural low flows caused by droughts have occurred historically, but are now exacerbated by flow diversions. Where water diversions lead to lower instream flows, LCT is affected by increased water temperature, limited access to aquatic habitats, and increased opportunity for competition between fish species (Spence *et al.* 1996, Harvey *et al.* 2006). Dewatering of stream channels during the irrigation season may result in stranding of fish, exposure and desiccation of redds (spawning nests) and nursery habitat, and disruption of LCT migratory patterns (Spence *et al.* 1996).

Many diversion structures fragment watersheds and act as barriers to fish migration, limiting the ability of migrating adults, juveniles, and fry to migrate to required life history habitats (Fausch *et al.* 2002, Ovidio and Philippart 2002, Compton *et al.* 2008). Certain barriers are complete obstructions to upstream migration, while others may be partial barriers. When access is limited, fish may spawn in and utilize sub-optimal habitats. Out-migrating fry and juveniles may be injured or killed during downstream migration through entrainment into irrigation canals or passage over obstructions (Carlson and Rahel 2007, Roberts and Rahel 2008).

The combined effects of water management activities result in a loss of habitat diversity required by native aquatic species (Allan 2004, Anderson *et al.* 2006). Degradation of native riparian communities associated with altered hydrology and land use practices has added to the loss of channel diversity and habitat complexity (Nilsson and Berggren 2000, Allan 2004). Healthy, intact riparian zones provide hydraulic diversity, add structural complexity, buffer the energy of runoff events and erosive forces, moderate temperatures, and provide a source of nutrients (Naiman and Décamps 1997). Riparian zones are especially important as a source of organic

matter in the form of woody debris (Naiman and Décamps 1997). Woody debris helps control the amount and quality of pool habitat and adds complexity to the habitat (Montgomery *et al.* 2003).

Water management throughout the historical range of LCT continues to negatively impact LCT through reduced water quality and quantity, fish entrainment into irrigation systems, fish barriers, and the loss of habitat diversity.

Fire

Fish mortalities can occur from increases in water temperatures which exceed lethal levels, fire induced changes in pH, increased ammonium levels from smoke gases absorbed into surface waters, and increased phosphate levels leached from ash (Brown 1989, Norris *et al.* 1991, Spencer and Hauer 1991, Rinne 1996, Rieman and Clayton 1997, Gresswell 1999, Earl and Blinn 2003, Ranalli 2004, Neary *et al.* 2005). Direct mortality of fish have been observed mainly in smaller streams due to greater impacts from fire on smaller aquatic habitats (Rinne and Jacoby 2005, Howell 2006).

Most negative effects to aquatic species after wildfire are due to the immediate loss or alteration of habitat and indirect effects. Riparian vegetation is directly consumed by fire which may cause an increase in water temperature and the loss of cover for aquatic species (Dunham *et al.* 2007). Riparian plant species have adapted to disturbances such as fire which, coupled with being in a moist environment, facilitates rapid recovery of riparian habitat following fire; however, recovery rates depend on the condition of the riparian area prior to the fire, the fire severity, post-fire flooding, and post-fire management (Miller 2000, Bond and Midgley 2003, Dwire and Kauffman 2003, Pettit and Naiman 2007, Halofsky and Hibbs 2009, Jackson and Sullivan 2009). Soil degradation can result from accelerated soil erosion, loss of vegetative cover, oxidation of soil organic matter, and impairment of other soil physical, chemical, and biological properties (Neary *et al.* 2005). Soil erosion on slopes can contribute to bank erosion in stream channels and siltation of riparian and aquatic plants leading to sediment loading in streams, which can be detrimental to aquatic species (Newcombe and MacDonald 1991, Bash *et al.* 2001, Burton 2005).

Increases in stream temperature are a common occurrence after a disturbance such as wildfire due to loss of riparian vegetation and increased solar radiation (Gresswell 1999, Moore *et al.* 2005, Dunham *et al.* 2007, Isaak *et al.* 2010, Mahlum *et al.* 2011). The magnitude and duration of these temperature increases are variable and depend on many factors which include past disturbance, elevation, groundwater inputs, aspect, percent of the watershed burned, size of watershed, riparian vegetation recovery, and post-fire channel reorganization due to flooding (Dunham *et al.* 2007).

Macroinvertebrate communities are strongly influenced by substrate instability associated with post-fire erosional processes (Arkle *et al.* 2010). Effects include changes in functional feeding groups (La Point 1983), more annual variation (Richards and Minshall 1992), and changes in abundance, diversity, and species richness (Roby 1989, Lawrence and Minshall 1994, Minshall *et al.* 1995, Roby and Azuma 1995, Mihuc *et al.* 1996, Minshall 2003, Mellon *et al.* 2008). Species best adapted to post fire stream conditions can be characterized as those which prefer a broad range of physical habitat (Mihuc *et al.* 1996, Lepori and Hjerdt 2006). Taxa which require specialized habitat needs respond much slower to disturbances such as fire (Mihuc *et al.* 1996, Lepori and Hjerdt 2006).

Post-fire hydrologic events can severely reduce or extirpate local fish populations (Novak and White 1990, Propst *et al.* 1992, Bozek and Young 1994, Rinne 1996, Rieman and Clayton 1997, Burton 2005, Sestrich *et al.* 2011). Recolonization rates depend on the proximity and relative location of refugia, access from refugia to disturbed areas (*e.g.*, no fish barriers), and the occurrence of complex life history traits and overlapping generations (Gresswell 1999, Dunham *et al.* 2003, Howell 2006, Dunham *et al.* 2007, Neville *et al.* 2009, Sestrich *et al.* 2011). Isolated fish populations are at a much higher risk of extinction because they cannot recolonize after a large disturbance (Rinne 1996, Dunham *et al.* 2003, Burton 2005, Dunham *et al.* 2007). Additionally, effects on small headwater streams are more severe because larger proportions of the drainage are burned at these smaller spatial scales, in contrast to larger stream orders, where relatively small proportions of the drainage burn (Romme *et al.* 2011, Sestrich *et al.* 2011).

Climate Change

The Intergovernmental Panel on Climate Change (IPCC) states that of all ecosystems, freshwater ecosystems will have the highest proportion of species threatened with extinction due to climate change (Settele *et al.* 2014). Species with narrow temperature tolerances and cold-water species such as LCT will likely experience the greatest effects from climate change, and it is anticipated that populations located at the margins of the species' hydrologic and geographic distributions will be affected first (Bates *et al.* 2008, Rieman and Isaak 2010). The impacts to LCT from climate change are not known with certainty. Climate change is predicted to have several effects on cold water habitat including: (1) Increased water temperature; (2) decreased stream flow; (3) change in the hydrograph; (4) increased frequency and severity of extreme events such as drought and floods; and (5) changing biotic interactions between native and nonnative species (Stewart *et al.* 2005, Ficke *et al.* 2007, Bates *et al.* 2008, Webb *et al.* 2008, Kaushal *et al.* 2010, PRBO Conservation Science 2011, Wehner *et al.* 2011, Wenger *et al.* 2011). Haak *et al.* (2010) analyzed the potential cumulative impacts of increased stream temperatures, winter flooding, wildfire, and drought on the persistence of 10 native salmonids in the western United States, including LCT.

Fifty-five LCT conservation populations across the current range of the species are at high risk of one or more climate risk factors; however, only nine of these conservation populations meet persistence criteria (Haak *et al.* 2010). In response to increasing temperatures, LCT will shift their distributions to northern latitudes (if possible) and/or higher elevations to find adequate stream temperatures (Keleher and Rahel 1996, Poff *et al.* 2002). This will likely increase fragmentation of populations and coupled with increases in stochastic events (*e.g.*, fire, flood, drought) will further disrupt metapopulation dynamics which increases the probability of extinction (Dunham *et al.* 1997, Fagan 2002, Opdam and Wascher 2004, Frankham 2005, Wilcox *et al.* 2006). Restoring physical connections among aquatic habitats may be the most effective and efficient step in restoring or maintaining the productivity and resilience of many aquatic populations (Bisson *et al.* 2003, Dunham *et al.* 2003, Rieman *et al.* 2003, Dunham *et al.* 2007, Rieman and Issak 2010). The focus should be to protect aquatic communities in areas where they remain robust and restore habitat structure and life history complexity of native species where aquatic ecosystems have been degraded (Gresswell 1999, Seavy *et al.* 2009, Rieman and Issak 2010).

Paiute Cutthroat Trout (rangewide)

Paiute cutthroat trout were listed by the Service on March 11, 1967, as endangered under the Endangered Species Preservation Act of 1966 (Service 1967) and subsequently reclassified as threatened on July 16, 1975, under the ESA, to facilitate management (Service 1975). There is no designated critical habitat for PCT. Paiute cutthroat trout are an inland subspecies (one of 14 recognized subspecies of cutthroat trout in the western United States) of cutthroat trout endemic to the Silver King Creek watershed, Alpine County, California (Behnke 1992).

A recovery plan for the PCT was prepared in 1985 (Service 1985a). The objectives of the recovery plan were to reestablish a pure population of PCT in Silver King Creek above Llewellyn Falls and to secure and maintain the integrity of the occupied habitats in Silver King

Creek, North Fork Cottonwood Creek, and Stairway Creek, all which occur outside of the historical habitat. In 2004, the Service published a Revised Recovery Plan for the PCT to incorporate recent research data and address the species' current status, threats, distribution, and recovery needs (Service 2004). The Service published 5-year Reviews for PCT in 2008 and 2013 (Service 2008b, 2013). Relevant information on the status of PCT, life history traits, population dynamics, habitat requirements, threats, and historical and current distribution can be found in the Revised Recovery Plan (Service 2004) and the 5-year Reviews (Service 2008b, 2013).

Paiute cutthroat trout occupy habitat in five widely separated watersheds. Factors that historically influenced the decline in the species include: (1) Hybridization, predation, and competition with introduced nonnative species; (2) small isolated populations; and (3) degradation of habitat due to logging and grazing management. Many of these actions continue today and the threats to PCT are similar to those threats described above for LCT (competition and hybridization with nonnative salmonids, population isolation, population size, habitat fragmentation, habitat availability, grazing, fire and climate change); therefore, we have not reiterated the discussion for those threats in this section.

The historical distribution of PCT was limited to 11.1 mi of habitat in Silver King Creek (Alpine County), from Llewellyn Falls downstream to barriers in Silver King Canyon, as well as the accessible reaches of three small named tributaries: Tamarack Creek, Tamarack Lake Creek, and the lower reaches of Coyote Valley Creek downstream of barrier falls (Service 2004). Paiute cutthroat trout now occupy approximately 23.5 mi of habitat in five widely distributed drainages outside of their historical range, two of which are located on the Inyo NF. The Silver King Creek population declined dramatically during the 2013 to 2016 drought (CDFW 2015a). In August of 2017, the North Fork Cottonwood Creek population was used as a source population to augment the existing population in Silver King Creek on the Humboldt-Toiyabe NF to ameliorate the effects from the drought.

North Fork Cottonwood Creek and Cabin Creek are located in the White Mountains Wilderness, Inyo National Forest, Mono County, California. Paiute cutthroat trout were first established in North Fork Cottonwood Creek in 1946 and currently occupy approximately 3.4 mi of stream habitat. Cabin Creek was established in 1968 and 1.5 mi of stream habitat are occupied (Service 2004, 2013).

Owens Tui Chub (rangewide)

Owens tui chub, a member of the minnow family (Cyprinidae; Miller 1969), was listed as endangered on August 5, 1985 (Service 1985b). The Service completed a 5-year Review of the status of the OTC in 2009 (Service 2009b). At the same time the OTC was listed, the Service also designated critical habitat (Service 1985b). There is no designated critical habitat located in the action area; therefore, it will not be discussed further.

The OTC is endemic to the Owens Basin in Mono and Inyo Counties, California. At the time of listing, the OTC was known to occur at two sites in the northern part of its historic range, Hot Creek Headwaters and Upper Owens Gorge. A population at Cabin Bar Ranch in the southern part of its historic range was subsequently discovered, but this population has been extirpated

from this site. Currently, the OTC is restricted to six isolated sites, all of which have been artificially created or altered. These sites are Hot Creek Headwaters, Little Hot Creek Pond, Upper Owens Gorge, Sotcher Lake, White Mountain Research Center (formerly the White Mountain Research Station), and Mule Spring. The populations located at Hot Creek Headwaters, Upper Owens Gorge, and White Mountain Research Center are located on City of Los Angeles' land, which is managed by the Los Angeles Department of Water and Power (LADWP). The Little Hot Creek Pond and Sotcher Lake populations are located on the Inyo NF. The Mule Spring population is located on land managed by the Bureau of Land Management (BLM). Nonnative species [*e.g.*, rainbow and brown trout, mosquitofish (*Gambusia affinis*), bullfrogs (*Lithobates catesbeianus*), and presumably Lahontan Creek tui chub (*Gila bicolor* ssp. *obesa*)] are present at five of the six OTC sites.

Information on OTC abundance or changes in population size is limited or unknown for these populations, and when counts have been made, the methodologies used to estimate population size have varied (Malengo 1999, Geologica 2003, Holmes *et al.* 2008). While we know that these populations currently exist, we are unable to determine whether they are increasing, decreasing, or stable. No information is available on population age structure, sex ratio, or mortality. See the 5-year Review for more specific information on distribution and abundance (Service 2009b).

At Hot Creek Headwaters there are two springs (AB and CD Springs) that are occupied by OTC. One of these springs, AB Spring, contains introgressed OTC. Both springs are the headwaters for Hot Creek, a tributary of the Owens River. The habitat for AB Spring has 4 spring discharge locations among its 400-foot long, flowing channel (McEwan 1991). The habitat for CD Spring has 5 spring discharge locations and is about 600 ft long (McEwan 1990, 1991). Both springs are similar in width (20.5 ft) and depth (0.5 to 2.5 ft; McEwan 1990, 1991). Rainbow trout, a competitor with the OTC for food and a predator of its eggs and fry, are present.

The Little Hot Creek Pond is a man-made pond constructed by the USFS in 1986 to enhance waterfowl habitat. The stream channel was impounded about 0.25 mi downstream from the thermal headsprings of Little Hot Creek (Moskowitz 1989). The pond is shallow; covered with muskgrass (*Chara* sp.), an invasive alga which provides cover for the chubs; and cattail (*Typha* sp.) is abundant. Mosquitofish are also present. Mosquitofish prey on the eggs and fry of OTCs and compete for aquatic insects. The pond is currently fenced to exclude livestock and recreation uses. The access road along the edge of the enclosure area has been surfaced with gravel to mitigate dust impacts to the pond.

The portion of the Owens River, which supports the Upper Owens Gorge population, is located below Crowley Lake and Long Valley Dam. The water source for the Upper Owens Gorge is seepage through the Long Valley Dam. Owens tui chubs are located downstream of the dam and upstream of a weir (a low dam built across a stream to raise water level or divert water), which is 5,232 ft below the dam. The dam and weir function as barriers to movement of nonnative fish species from Crowley Lake above the dam and the Owens River below the weir. The aquatic habitat in the Upper Owens Gorge consists of narrow, heavily silted channels (Bogan *et al.* 2002). Lacustrine habitat for OTC is confined to a long pond created by a beaver dam. The banks of the pond and channel are heavily vegetated with willow (*Salix* sp.), cattail, grasses, stinging

nettle (*Urtica* sp.), and wild rose (*Rosa californica*). Pondweed (*Potamogeton* sp.) is abundant along the banks (Bogan *et al.* 2002). Nonnative fish present are present throughout Owens Gorge and include brown trout, which prey on OTCs, and Lahontan tui chub, which hybridize with OTCs (Malengo 1998).

Sotcher Lake is a 64-ac alpine lake located at 7,651 ft in the Upper San Joaquin River watershed of the western Sierra Nevada. Nonnative rainbow and brown trout are present. There is no additional information available about the habitat at Sotcher Lake. There is no information on the source of OTC or how they were introduced into Sotcher Lake. It is believed this introduction occurred in the early 1950s and may have occurred inadvertently when trout were stocked from the Hot Creek Fish Hatchery (Chen *et al.* 2007). The current status of OTC in Sotcher Lake is not known although they were collected from Sotcher Lake in 2002 (Chen *et al.* 2007). In 2010, the California Department of Fish and Wildlife (CDFW) and Service evaluated the fisheries stocking program to address concerns about recreational fish stocking impacts on threatened and endangered species (ICF Jones and Stokes 2010). In that analysis, Sotcher Lake was not identified as a body of water containing OTC, thus Sotcher Lake continues to be stocked with rainbow trout and also contains brown trout.

The White Mountain Research Center is a unit of the University of California Natural Reserve System, and the University of California, Los Angeles Institute of the Environment and Sustainability. It is located on land leased from the LADWP and near the Owens River and the town of Bishop, California. There are 3 lined, square, man-made ponds approximately 40 ft by 40 ft (Buckmaster 2017) located on the property; these small ponds are fed by groundwater. Each pond has a drain at the bottom center to allow water to flow through the ponds (Bogan *et al.* 2002). There is also one small, unlined, rectangular, man-made pond. In 1997, the CDFW translocated OTC to the three ponds in order to establish a new population of OTC from the Upper Owens Gorge stock and protect them from hybridization with Lahontan Creek tui chub and predation. In addition to cattail management, used tires were placed into the ponds to provide fish cover, and artificial spawning substrates were placed on the pond edges. The CDFW has not conducted population monitoring or water quality monitoring at this location since the original translocation (Buckmaster 2017). Nonnative fish are not present in any of the ponds.

The Mule Spring population occupies a small, man-made pond that measures 30 ft by 42 ft (Bogan *et al.* 2002). The spring that feeds the pond flows from a nearby old mine site. At times, if left unmanaged, cattails can dominate most of the pond. Muskgrass grows around the pond edge and willows grow in the channel below the pond. Nonnative fish are not present, but nonnative bullfrogs are present (Bogan *et al.* 2002).

Owens tui chub populations have been and continue to be impacted by: (1) Nonnative species interactions (predation, hybridization, competition); (2) the loss or modification of habitat; and (3) population isolation. These threats are discussed in more detail in the following paragraphs.

Nonnative Species Interactions

In this section, we will discuss the nonnative species interactions that negatively affect OTCs and their habitat. This includes predation, hybridization, and competition with nonnative species.

Predation

The Service identified predation by nonnative fishes as a factor in reducing the extent of OTC populations. In the final listing rule, the Service (1985b) said that the OTC successfully reproduces in the headwater springs of Hot Creek, where the population is apparently viable, although reduced in size from predation by nonnative fishes. Chen *et al.* (2007) identified predation by nonnative largemouth bass (*Micropterus salmoides*) and brown trout as eliminating OTCs from much of their historical range in the Owens River. These species are abundant in the Owens River system (Chen *et al.* 2007). The presence of nonnative fishes, which are predators of OTC, in the Owens Basin is the greatest threat to OTC and has limited the locations in which the OTC can survive and persist. Nonnative rainbow and brown trout are present at three (Hot Creek Headwaters, Owens Gorge, and Sotcher Lake) of the six OTC sites.

Subsequent to the listing of the OTC in 1985, a new population of OTCs was established at Fish Slough. This population was lost within a short time due to introduction of and predation by largemouth bass (S. Parmenter, California Department of Fish and Wildlife, *in litt.* 2009 as cited in Service 2009b). The loss of the Cabin Bar Ranch population has been attributed to the introduction of largemouth bass as well as the dewatering of the pond the OTC inhabited (N. Buckmaster, California Department of Fish and Wildlife, *in litt.* 2018).

Hybridization

The OTC and the closely related Lahontan Creek tui chub were, at one point, isolated from each other until Lahontan Creek tui chub were introduced into the OTC's range as baitfish. Lahontan Creek tui chubs were introduced as baitfish into many streams in the Owens Basin. This was first observed at Crowley Lake in 1973, where fishermen illegally introduced the Lahontan Creek tui chub (Miller 1973). Since that time, hybridization between the OTC and Lahontan Creek tui chub has been documented in Mono County at Hot Creek (downstream from Hot Creek Headwaters), Mammoth Creek, Twin Lakes-Mammoth, June Lake, and lower portion of Owens Gorge, and in Inyo County at A1 Drain, C2 Ditch, and McNally Canal (Malengo 1998, Madoz *et al.* 2005, Chen *et al.* 2007). Introgressed (incorporation of alleles from one species into the gene pool of a second) OTC have been more recently documented at AB spring (Benjamin and Finger 2016).

Competition

The final listing rule identified competition with nonnative fish species as a threat to the OTC. However, little specific information on the impact of competition on the OTC is available in the literature. Nonnative insectivorous fish occur at Hot Creek Headwaters (rainbow trout) and Little Hot Creek Pond (mosquitofish) (McEwan 1989). A major part of the diets for these nonnative

species is the same aquatic insects consumed by OTCs. Although information is not available for rainbow trout, mosquitofish are known to affect some southwestern native fishes through competition and predation (Deacon *et al.* 1964, Courtenay and Meffe 1989).

Habitat Loss and Modification

Man-made changes to aquatic habitat in the Owens Basin dramatically reduced suitable aquatic habitat for the OTC. Currently, most streams and rivers in the Owens Basin have been diverted and some impounded. Unregulated groundwater pumping is also a potential threat because it could result in reduced or no water flow to existing isolated springs and headwater springs of streams and result in a reduction or loss of aquatic habitat. Most of the water rights in the Owens Basin are owned by the City of Los Angeles. The LADWP operates and maintains dams, diversion structures, groundwater pumps, and canals to capture and convey much of the water from the Owens Basin to Los Angeles. The remaining groundwater, which provides water to isolated springs and springs that are the headwaters of streams in the Owens Basin, and surface water are used extensively for agriculture and municipal purposes in the Owens Basin. Additionally, the introduction of nonnative fish has resulted in a loss of habitat by reducing the ability of the OTC to persist in these locations. At the spring sites (Hot Creek Headwaters, Little Hot Creek Pond, and Mule Spring), invasive emergent plants (*e.g.*, cattail) have also altered the aquatic habitat through the deposition of large amounts of organic biomass, which can eventually convert aquatic habitat to upland habitat (Potter 2004). Dense emergent vegetation provides cover for nonnative predators of OTCs, such as bullfrogs and crayfish (*Procambarus* sp.). As a result of these changes to aquatic habitat, the OTC, which used to occur throughout the Owens River and its tributaries in the Owens Basin, is now restricted to six isolated, man-altered sites.

Population Isolation

As discussed under the Population Isolation section for LCT, isolated populations such as OTC are vulnerable to extirpation through demographic stochasticity, environmental stochasticity, catastrophes, loss of genetic heterozygosity, rare alleles, and human disturbance (Hedrick and Kalinowski 2000, Lande 2002, Reed and Frankham 2003, Noss *et al.* 2006, Pringle 2006).

Random variability in survival or reproduction can have a significant impact on population viability for populations that are small. Currently, OTC populations are small, between 100 and 10,000 individuals; therefore, random events that may cause high mortality, or decreased reproduction may have a significant effect on the viability of OTC populations. Furthermore, because the number of populations is small and each is vulnerable to this threat, the risk of extinction is exacerbated.

The creation and maintenance of small, often intensively managed, populations have prevented extinction of OTC. However, only six populations of the OTC exist, and they are isolated from each other. Completely isolated populations are the most severe form of fragmentation because gene flow among populations does not occur, thereby inflicting inbreeding depression on the population and reducing fitness (Hedrick and Kalinowski 2000, Reed and Frankham 2003, Frankham 2005, Scribner *et al.* 2006, Pritchard *et al.* 2007, Guy *et al.* 2008).

In small populations, such as the OTC, these factors may reduce the amount of genetic diversity retained within populations and may increase the chance that deleterious recessive genes are expressed. Loss of diversity could limit the species' ability to adapt to environmental changes and contributes to inbreeding depression (*i.e.*, loss of reproductive fitness and vigor). Deleterious recessive genes could reduce the viability and reproductive success of individuals. The isolation of remaining OTC populations that prevents natural genetic exchange will lead to a decrease in genetic diversity. Long-term prospects for the conservation of rare fishes such as the OTC depend on the availability of genetic variation within a population. This is the raw material to respond to natural selection and allow for continued evolutionary change (Meffe 1990).

Drought or predation in combination with a low population year could result in extinction. The origin of the environmental stochastic event can be natural or human-caused. The OTC has experienced population loss from environmental stochastic events and will likely do so in the future. The Cabin Bar Ranch population was lost because of an apparent failure to maintain adequate water quality and quantity and the introduction of nonnative predators. Owens tui chubs have also disappeared from the Owens Valley Native Fishes Sanctuary (Fish Slough). Reasons for the loss of this population are not known, but the small, isolated nature of this population likely contributed to their extirpation.

Catastrophic events are an extreme form of environmental stochasticity. In the past, they have occurred infrequently. In the future, climate change models suggest they will occur more frequently. Catastrophic events, such as severe floods or prolonged drought, can have disastrous effects on small populations and can directly result in extinction.

Climate Change

For the Sierra Nevada ecoregion, climate models predict that mean annual temperatures will increase by 3.2 to 4.3 degrees Fahrenheit by 2070, including warmer winters with earlier spring snowmelt and higher summer temperatures. However, it is expected that temperature and climate variability will vary based on topographic diversity (*e.g.*, wind intensity will determine east versus west slope variability) (PRBO Conservation Science 2011). Mean annual rainfall is projected to decrease 3.6 to 13.3 inches by 2070; however, projections have high uncertainty and one study predicts the opposite effect (PRBO Conservation Science 2011). Given the varied outputs from differing modeling assumptions, and the influence of complex topography on microclimate patterns, it is difficult to draw general conclusions about the effects of climate change on precipitation patterns in the Sierra Nevada (PRBO Conservation Science 2011). Snowpack is, by all projections, going to decrease dramatically (following the temperature rise and more precipitation falling as rain) (Kadir *et al.* 2013). Snyder *et al.* (2004 as cited in PRBO Conservation Science 2011) projected that snow accumulation will decrease significantly by 34 percent in the North Lahontan hydrologic region (Great Basin) of California. Higher winter streamflows, earlier runoff, and reduced spring and summer streamflows are projected, with increasing severity in the southern Sierra Nevada (PRBO Conservation Science 2011, Kadir *et al.* 2013).

Climate change during the next several decades may increase the duration and frequency of future droughts. Evidence from the most recent investigations indicates a drier future relative to current conditions. As mentioned above, annual snowpack in the Sierra Nevada and Cascade ranges (the former providing water to the Owens Basin) is expected to diminish greatly. In response to reduce snowpack, Moyle *et al.* (2013) predicts that stream flows will be increasingly driven by rainfall events rather than melting snow. An increase in the ratio of rain to snow will result in more peak flows during winter, increased frequency of high flow events (floods), diminished spring pulses, and protracted periods of low (base) flow. This sudden or prolonged degradation/loss of habitat may result in the loss of OTC populations.

Sierra Nevada Yellow-legged Frog, Northern Distinct Population Segment of Mountain Yellow-legged Frog, and Yosemite Toad (rangewide)

The Amended Programmatic contains detailed information in the Status of the Species and Environmental Baseline sections for the SNYLF, MYLF, and YT. The Service is incorporating by reference these sections of the Amended Programmatic, which includes the physical description of the species, current range and distribution, habitat and life history, and status and threats. For SNYLF and MYLF, the primary threats include habitat degradation and fragmentation, predation and disease, livestock grazing, climate change, and the interaction of these various stressors impacting small remnant populations. Other threats that may pose local habitat-related impacts include dams and water diversions, mining, packstock use, roads and timber management, fire management, and recreation. For YT, the threats are the same as those presented for the SNYLFs and MYLFs. Other threats that may pose local habitat-related impacts to include roads, timber harvest, fire suppression, recreation, and packstock use.

Designated Critical Habitat for Sierra Nevada Yellow-legged Frog, Northern Distinct Population Segment of Mountain Yellow-legged Frog, and Yosemite Toad

The Service is also incorporating by reference the Status of Critical Habitat and Critical Habitat Baseline sections for the SNYLF, MYLF, and YT. These sections provide an overview of the amount of designated critical habitat for these species, the PCEs of critical habitat, and brief descriptions and threats within each critical habitat unit. Below we briefly summarize the information on designated critical habitat in the action area for SNYLF, MYLF, and YT. We also describe the PCEs of designated critical habitat.

Sierra Nevada Yellow-legged Frog

In the action area, there are 6 subunits of designated critical habitat for SNYLF out of a total of 24 subunits. These six subunits are: White Mountain (2M), Cathedral (3B), Minarets (3C), Mono Creek (3D), Evolution/Le Conte (3E), and Pothole Lakes (3F). There are 97,046 ac (or 6 percent) of total designated critical habitat on the Inyo NF.

Northern Distinct Population Segment of the Mountain Yellow-legged Frog

In the action area, there are 3 subunits of designated critical habitat for the MYLF out of a total of 6 subunits. These three subunits are: Sequoia Kings (4C), Coyote Creek (5B), and Mulkey Meadows (5C). There are 12,325 ac (or 6 percent) of total designated critical habitat on the Inyo NF.

In 2016, the Service identified the following PCEs for the SNYLF and MYLF (Service 2016b):

(1) Aquatic habitat for breeding and rearing. Habitat that consists of permanent water bodies, or those that are either hydrologically connected with, or close to, permanent water bodies, including, but not limited to, lakes, streams, rivers, tarns, perennial creeks (or permanent plunge pools within intermittent creeks), pools (such as a body of impounded water contained above a natural dam), and other forms of aquatic habitat. This habitat must:

- (a) For lakes, be of sufficient depth not to freeze solid (to the bottom) during the winter 5.6 feet, but generally greater than 8.2 feet, and optimally 16.4 feet or deeper (unless some other refuge from freezing is available).
- (b) Maintain a natural flow pattern, including periodic flooding, and have functional community dynamics in order to provide sufficient productivity and a prey base to support the growth and development of rearing tadpoles and metamorphs.
- (c) Be free of introduced predators.
- (d) Maintain water during the entire tadpole growth phase (a minimum of 2 years). During periods of drought, these breeding sites may not hold water long enough for individuals to complete metamorphosis, but they may still be considered essential breeding habitat if they provide sufficient habitat in most years to foster recruitment within the reproductive lifespan of individual adult frogs.
- (e) Contain:
 - (i) Bank and pool substrates consisting of varying percentages of soil or silt, sand, gravel, cobble, rock, and boulders (for basking and cover);
 - (ii) shallower microhabitat with solar exposure to warm lake areas and to foster primary productivity of the food web;
 - (iii) open gravel banks and rocks or other structures projecting above or just beneath the surface of the water for adult sunning posts;
 - (iv) aquatic refugia, including pools with bank overhangs, downfall logs or branches, or rocks and vegetation to provide cover from predators; and
 - (v) sufficient food resources to provide for tadpole growth and development.

(2) Aquatic nonbreeding habitat (including overwintering habitat). This habitat may contain the same characteristics as aquatic breeding and rearing habitat (often at the same locale), and may include lakes, ponds, tarns, streams, rivers, creeks, plunge pools within intermittent creeks, seeps, and springs that may not hold water long enough for the species to complete its aquatic life cycle. This habitat provides for shelter, foraging, predator avoidance, and aquatic dispersal of juvenile and adult mountain yellow-legged frogs. Aquatic nonbreeding habitat contains:

- (a) Bank and pool substrates consisting of varying percentages of soil or silt, sand, gravel, cobble, rock, and boulders (for basking and cover);
- (b) open gravel banks and rocks projecting above or just beneath the surface of the water for adult sunning posts;
- (c) aquatic refugia, including pools with bank overhangs, downfall logs or branches, or rocks and vegetation to provide cover from predators;
- (d) sufficient food resources to support juvenile and adult foraging;
- (e) overwintering refugia, where thermal properties of the microhabitat protect hibernating life stages from winter freezing, such as crevices or holes within bedrock, in and near shore; and/or
- (f) streams, stream reaches, or wet meadow habitats that can function as corridors for movement between aquatic habitats used as breeding or foraging sites.

(3) Upland areas.

- (a) Upland areas adjacent to or surrounding breeding and nonbreeding aquatic habitat that provide area for feeding and movement by mountain yellow-legged frogs:
 - (i) For stream habitats, this area extends 82 feet from the bank or shoreline;
 - (ii) in areas that contain riparian habitat and upland vegetation (for example, mixed conifer, ponderosa pine, montane conifer, and montane riparian woodlands), the canopy overstory should be sufficiently thin (generally not to exceed 85 percent) to allow sunlight to reach the aquatic habitat and thereby provide basking areas for the species;
 - (iii) for areas between proximate (within 984 feet) of water bodies (typical of some high mountain lake habitats), the upland area extends from the bank or shoreline between such water bodies; and
 - (iv) within mesic habitats such as lake and meadow systems, the entire area of physically contiguous or proximate habitat is suitable for dispersal and foraging.
- (b) Upland areas (catchments) adjacent to and surrounding both breeding and nonbreeding aquatic habitat that provide for the natural hydrologic regime (water quantity) of aquatic habitats. These upland areas should also allow for the maintenance of sufficient water quality to provide for the various life stages of the frog and its prey base.

Yosemite Toad

In the action area, there are 5 units of designated critical habitat for YT out of a total of 16 units. The five units are: Hoover Lakes (Unit 4), Tuolumne Meadows/Cathedral (Unit 5), Silver Divide (Unit 12), Humphreys Basin/Seven Gables (Unit 13), and Upper Goddard Canyon (Unit 15). There are 83,940 ac (or 11 percent) of total designated critical habitat on the Inyo NF.

In 2016, the Service identified the following PCEs for the YT (Service 2016b):

- (1) Aquatic breeding habitat.
 - (a) This habitat consists of bodies of fresh water, including wet meadows, slow-moving streams, shallow ponds, spring systems, and shallow areas of lakes, that:
 - (i) Are typically (or become) inundated during snowmelt;
 - (ii) hold water for a minimum of 5 weeks, but more typically 7 to 8 weeks; and
 - (iii) contain sufficient food for tadpole development.
 - (b) During periods of drought or less than average rainfall, these breeding sites may not hold surface water long enough for individual Yosemite toads to complete metamorphosis, but they are still considered essential breeding habitat because they provide habitat in most years.
- (2) Upland areas.
 - (a) This habitat consists of areas adjacent to or surrounding breeding habitat up to a distance of 0.78 miles in most cases (that is, depending on surrounding landscape and dispersal barriers), including seeps, springheads, talus and boulders, and areas that provide:
 - (i) Sufficient cover (including rodent burrows, logs, rocks, and other surface objects) to provide summer refugia;
 - (ii) foraging habitat;
 - (iii) adequate prey resources;
 - (iv) physical structure for predator avoidance;
 - (v) overwintering refugia for juvenile and adult Yosemite toads;
 - (vi) dispersal corridors between aquatic breeding habitats;
 - (vii) dispersal corridors between breeding habitats and areas of suitable summer and winter refugia and foraging habitat; and/or
 - (viii) the natural hydrologic regime of aquatic habitats (the catchment).
 - (b) These upland areas should also maintain sufficient water quality to provide for the various life stages of the Yosemite toad and its prey base.

Sierra Nevada Bighorn Sheep (rangewide)

Historically, SNBS occurred along and east of the alpine crest of the Sierra Nevada from the Sonora Pass area south to Olancha Peak (Service 2007a). They also occurred in similar habitat west of the Kern River as far south as Maggie Mountain, with concentrated use in the regions of Mineral King, Big Arroyo, and Red Spur (Jones 1950). Additional evidence suggested that herds utilized non-alpine habitat farther south near Walker Pass (Jones 1949, Garlinger 1987,

Wehausen *et al.* 1987). Whether those southernmost herds were taxonomically the same as those that occurred farther north in the Sierra Nevada or were desert bighorn sheep (*Ovis canadensis nelsoni*) is unknown.

On April 20, 1999, the Service granted emergency endangered status to the distinct population segment of California bighorn sheep (*Ovis canadensis californiana*) occupying the Sierra Nevada of California (Service 1999). It simultaneously published a proposed rule to list the distinct population segment as an endangered species pursuant to the ESA. The Service published the final rule granting endangered status to the distinct population segment on January 3, 2000 (Service 2000).

At the time the final rule was published, there were 5 disjunct subpopulations (Mount Warren/Mount Gibbs, Wheeler Ridge, Mount Baxter/Sawmill Canyon, Mount Williamson, and Mount Langley) and an estimated 125 individuals remaining along the eastern Sierra Nevada of California. Reasons for listing included predation by mountain lions (*Puma concolor*), disease, naturally occurring environmental events, and genetic concerns due to the small population size.

On July 25, 2007, the Service recognized a taxonomic revision for this bighorn sheep subspecies (*Ovis canadensis californiana*) (Wehausen *et al.* 2005) and proposed to change the listed entity from a distinct population segment to a subspecies (*Ovis canadensis sierrae*) (Service 2007b). The final rule for taxonomic revision occurred on August 5, 2008 (Service 2008c).

On September 24, 2007, the Service and CDFW jointly approved the Final Recovery Plan for the Sierra Nevada Bighorn Sheep (Service 2007a; Recovery Plan). The Recovery Plan identified 16 herd units throughout the range of the species. These herd units are either currently occupied by SNBS or have habitat characteristics conducive to future population establishment. Of the 16 herd units, the Recovery Plan identified the establishment of populations within 12 herd units as essential for recovery. Three natural breaks in the distribution of the herd units separate them into four distinct recovery units (Kern, Southern, Central, and Northern).

As of 2018, there are at least 251 yearling and adult ewes (L. Greene, California Department of Fish and Wildlife, *in litt.* 2018; Table 1). This represents a minimum number as surveys are still ongoing. All 12 herd units considered essential for recovery remain occupied with the herds distributed throughout the 4 recovery units. The Recovery Plan identified a numerical goal of 305 yearling and adult females.

Table 1. The minimum number of yearling and adult females located throughout essential herd units and recovery units (Greene, *in litt.* 2018).

Recovery Unit	Herd Unit	Number of Ewes	Recovery Goals
Kern	Big Arroyo	9	50
	Laurel Creek	2	
Southern	Olancho Peak	22	155
	Mt. Langley	27	
	Mt. Williamson	8	
	Mt. Baxter*	48	
	Sawmill Canyon	45	
	Taboose Creek	1	
Central	Wheeler Ridge*	52	50
	Convict Creek	6	
Northern	Mt Warren	6	50
	Mt Gibbs	25	
	Total	251	305

*2016 minimum counts

Sierra Nevada bighorn sheep populations have been and continue to be impacted by predation, disease, naturally occurring environmental events, other sources of mortality, and issues related to low genetic diversity.

Predation

In the Sierra Nevada, mountain lions are the primary predator of adult SNBS, accounting for 96 percent of losses attributed to predation with the remaining losses attributed to coyotes (*Canis latrans*) and bobcats (*Felis rufus*) (Service 2007a). From 1975 to 2000, predation accounted for at least 54.5 percent of 147 SNBS deaths. This percentage could be considerably higher because the cause of many mortalities is unknown (Service 2007a).

Mountain lion predation of SNBS on winter ranges has accounted for the majority of documented mortalities since the late 1970s. This predation increased from the 1970s to the 1980s which Wehausen (1996) postulated as the cause of a coincident and marked decrease in winter range use by SNBS. Following the emergency endangered listing of SNBS, the CDFW initiated a program of focused control of mountain lions. In 2000, the program began placing telemetry collars on mountain lions near the ranges of SNBS and closely monitoring them. Until 2011, CDFW contracted with the U.S. Department of Agriculture's Animal and Plant Health Inspection Service's Wildlife Services (Wildlife Services) to euthanize mountain lions that preyed on SNBS. From 1999 to 2010, Wildlife Services euthanized an average of two mountain lions per year to protect SNBS. At this time, the number of mortalities from mountain lion predation on collared animals appears to be increasing (Table 2). In response to the heavy predation by mountain lions on female bighorn sheep in the Mount Langley herd during winter 2016/2017, two mountain lions were killed by the CDFW to reduce further impacts to bighorn sheep.

Table 2. Number of Mortalities Caused by Mountain Lion Predation (CDFW 2013, 2014, 2015b; T. Stephenson, California Department of Fish and Wildlife, *in litt.* 2016; Stephenson, *in litt.* 2017).

Bighorn Sheep Year (May 1 – April 30)	Number of Mortalities From Mountain Lion Predation
2012-2013	3
2013-2014	2
2014-2015	3
2015-2016	6
2016-2017	19

Disease and Parasitism

The potential transfer of virulent disease organisms from domestic sheep to SNBS was a factor in their listing. Cattle and domestic goats may also transmit diseases to bighorn sheep though disease transmission between bighorn sheep and domestic sheep appears to be more virulent. Therefore, the following focuses primarily on the consequences of disease transmission from domestic sheep to bighorn sheep.

Bighorn sheep are closely related to domestic sheep and share many diseases with them, including pneumonias of viral and bacterial origin, contagious ecthyma, psoroptic scabies, bluetongue virus infection, and others (Service 2007a). Diseases transferred through contact with domestic sheep may have played a major role in the disappearance of certain herds in the Sierra Nevada beginning around 1870 (Wehausen 1985). Although we have no direct documentation of disease-related die-offs in SNBS populations, the history of bighorn sheep in the United States provides numerous examples of major die-offs following contact with domestic sheep [Goodson 1982, Foreyt and Jessup 1982, Singer *et al.* 2001, Coggins 2002, Western Association of Fish and Wildlife Agencies (WAFWA) 2010]. Examples of disease-related studies and observations in the following discussion are primarily associated with other subspecies of bighorn sheep, but we have included them to support the discussion of the magnitude of this threat as it relates to SNBS.

Pneumonia caused by *Pasteurella* (some species now called *Mannheimia*) and *Mycoplasma ovipneumoniae* alone, or in combination with other pathogens, is the most significant disease threat for bighorn sheep (Bunch *et al.* 1999, Besser *et al.* 2014). Outbreaks of respiratory disease from *Pasteurella* infections may also occur in bighorn sheep herds without known contact with domestic livestock (Miller *et al.* 1991). The respiratory disease complex of bighorn sheep is multi-factorial, and environmental and anthropogenic stressors likely allow opportunistic microorganisms to become pathogenic in bighorn sheep herds (Service 2007a). Although researchers have never empirically proven transmission of disease from domestic sheep to bighorn sheep under range conditions, numerous studies have demonstrated that contact between bighorn sheep and domestic sheep can result in pneumonia-related die-offs in bighorn sheep (Onderka and Wishart 1988, Foreyt 1989, Callan *et al.* 1991, Lawrence *et al.* 2010). In addition, inoculations of bighorn sheep with *Pasteurella* from the respiratory tract of healthy domestic

sheep (Onderka *et al.* 1988, Foreyt *et al.* 1994, Foreyt and Silflow 1996) has resulted in respiratory disease and death of the bighorn sheep, but not that of domestic sheep treated identically.

Lungworms of the genus *Protostrongylus* can be important contributors to pneumonia in bighorn sheep in the Rocky Mountains (Forrester 1971, Woodard *et al.* 1974). Sierra Nevada bighorn sheep carry *Protostrongylus* lungworms but parasite loads are low, and not considered a management concern (Wehausen 1979, 1980).

Researchers attributed many die-offs of bighorn sheep in the late 1800s and early 1900s, including some in the Sierra Nevada, to scabies contracted from domestic sheep (Jones 1950, Buechner 1960). Scabies occurs in bighorn sheep east of the Sierra Nevada (Clark *et al.* 1988). From 1979 to 1988, a large sampling of SNBS found no clinical evidence of scabies. Similarly, serum samples showed no evidence of exposure to *Psoroptes* (Mazet *et al.* 1992).

Domestic goats can also carry various pathogens including *M. haemolytica* and *M. ovipneumoniae*, which can cause pneumonia in bighorn sheep. Drew and Weiser (2017) found that herd and pack goats both carried respiratory bacteria that have been associated with pneumonia in bighorn sheep, but herd goats had a higher prevalence of *Mannheimia* spp. including *M. haemolytica*. This suggests that domestic goats may be carriers of pathogens that can cause pneumonia in bighorn sheep. However, the results from commingling studies between goats and bighorn sheep yield results different from those observed when domestic sheep and bighorn sheep are comingled. Besser *et al.* (2017) conducted commingling experiments using domestic goats infected with *M. ovipneumoniae*. Infected domestic goats transmitted the pathogen to bighorn sheep, and bighorn sheep exhibited symptoms of respiratory disease but there were no fatalities (Besser *et al.* 2017). Domestic goats may also transmit other diseases that can result in mortality. In Arizona, there was an outbreak of infectious keratoconjunctivitis (inflammation of the eye) and contagious ecthyma in bighorn sheep in the Silver Bell Mountains due to contact with domestic goats (Heffelfinger 2004, Jansen *et al.* 2006).

The impacts of domestic cattle grazing within bighorn sheep habitat have not been well documented. Researchers have reported hemorrhagic disease and pneumonia resulting from bluetongue virus (BTV) infection in bighorn sheep (Robinson *et al.* 1967, Noon *et al.* 2002). Because of prolonged viremia (presence of viruses in the blood), cattle may be an important reservoir of BTV for *Culicoides* (biting midges) vectors (Osburn 2000) and a potential source of infection for other wild and domestic ungulates in areas climatically suitable for *Culicoides*. Singer *et al.* (1997) studied cattle, bighorn sheep, and mule deer (*Odocoileus hemionus*) in an area where the three species used common areas. Only cattle were seropositive to BTV, but deer and bighorn sheep were seropositive for *Babesia* sp., and *Psoroptes* mites were on bighorn sheep. Singer *et al.* (1997) concluded that cattle, deer, and bighorn sheep did not share similar patterns of exposure to the three pathogens and proposed that cattle did not constitute a health risk for bighorn sheep in that area. Foreyt (1994) reported no adverse effects on healthy bighorn sheep in one co-pasturing study with domestic cattle. In a follow-up study, one of five bighorn sheep co-pastured with cattle developed a fatal pneumonia and died on day 6 post introduction (Foreyt and Lagerquist 1996). Although cattle may carry *Pasteurella* spp. that are pathogenic to bighorn sheep, researchers hypothesize that “the nose to nose contact required for transmission of

P. haemolytica (renamed *Mannheimia haemolytica*) is less likely to occur between bighorn sheep and cattle” than with domestic sheep. This is because the social interactive behavior between bighorn sheep and cattle is less likely to result in nose-to-nose contact. They recommended further research to determine the compatibility of bighorn sheep and domestic cattle.

Heavy Winters, Avalanches, and Rockfalls

Naturally occurring, random, environmental events such as heavy winters, avalanches, and rockfalls represent additional sources of mortality for SNBS. During the 1990s, SNBS incurred major losses while remaining at high elevations during the winter. Sierra Nevada bighorn sheep that remained at high elevations during the winter suffered extreme cold, deep snow, and avalanches in heavy winters. Remaining at high elevation during winter also resulted in notably lower nutrient intake (Wehausen 1996). Mortality from avalanches can occur throughout the range of SNBS. This was most recently documented by the CDFW during the heavy winter of 2016/2017 (Stephenson, *in litt.* 2017). Due to small population size and because it is common for all members of one sex to occur in a single group, avalanche events can be significant sources of mortality.

Previously, it was thought that SNBS that remained at high elevations during the winter would have lower survival rates due to exposure to extreme cold, deep snow and avalanches in heavy winters and lower nutrient intake. However, new research by Spitz (2015) indicates that SNBS exhibit two different migratory strategies during the winter months. Sierra Nevada bighorn sheep may move to lower elevations or remain at high elevations during the winter. Sierra Nevada bighorn sheep in the Mount Gibbs Herd Unit, for instance, remain at high elevation year round and have one of the highest survival rates (Stephenson *et al.* 2012).

Roadkill

Two subpopulations (Mount Warren and Wheeler Ridge) have ranges that encompass paved roads, which expose animals from those subpopulations to potential hazards. Vehicles in Lee Vining Canyon have killed SNBS on several occasions (V. Bleich, pers. comm. 1999 as cited in Service 2000). In 2003, a vehicle hit a radio-collared animal along Highway 395 (Service 2007a).

Small and Isolated Populations

The naturally fragmented distribution of SNBS results in distinct herds. These geographically separated herds make up a metapopulation, which is a network of interacting herds (Schwartz *et al.* 1986, Bleich *et al.* 1990, Bleich *et al.* 1996, Torres *et al.* 1996). At the time of listing, the overall metapopulation of SNBS consisted of five subpopulations (Lee Vining Canyon, Wheeler Ridge, Mount Baxter, Mount Williamson, and Mount Langley) (Service 2000). Wehausen (2000) further subdivided the Lee Vining Canyon and Mount Baxter populations into smaller groups. By 2005, there were eight separate subpopulations (Mount Langley, Mount Baxter, Sawmill Canyon, Bubbs Creek, Mount Williamson, Wheeler Ridge, Mount Warren, and Mount Gibbs) (Wehausen and Stephenson 2005). This increase in the number of subpopulations was

due to the discovery of the Bubbs Creek subpopulation in 2002 and the regrouping of some individuals into different subpopulation groups based on new information about the interaction of individuals in certain areas.

A small amount of genetic exchange among herds via movements by rams can counteract inbreeding and associated increases in homozygosity (having two identical forms of a gene) that might otherwise develop within small, isolated populations (Schwartz *et al.* 1986). Rams have a much greater tendency than ewes to explore new ranges, which they may do in search of other ewes with which to breed (Bleich *et al.* 1996). If geographic distances between groups of ewes within metapopulations are not great, gene migration via rams occurs readily (Epps *et al.* 2005). In the absence of such a metapopulation structure, populations are isolated and may benefit from genetic enrichment via translocation between herds (Epps *et al.* 2006).

Long-term viability depends not on individual herds, but on the entire health of the metapopulation. Consequently, both genetic and demographic factors are important to population viability. Increases in inbreeding (mating among relatives) and genetic drift (random changes in gene frequency) accompany decreasing population sizes and can lead to decreasing levels of heterozygosity (a measure of genetic diversity) that may have negative demographic effects through inbreeding depression (reduction in fitness due to mating among relatives) (Soulé 1980) and loss of adaptability. Moreover, there is growing evidence that disease resistance is related to increased levels of heterozygosity (Carrington *et al.* 1999, Coltman *et al.* 1999).

In addition, the balance between rates of natural extinction and colonization among constituent populations is an important long-term process in metapopulation dynamics. Colonization rates must exceed extinction rates for a metapopulation to persist (Hanski 1991). This balance has not occurred for SNBS since 1850 due to the high rate of local extinctions, resulting in an increasingly fragmented distribution (Service 2007a).

Designated Critical Habitat for Sierra Nevada Bighorn Sheep

In 2008, the Service designated approximately 417,577 ac of critical habitat for this species in Tuolumne, Mono, Fresno, Inyo and Tulare Counties (Figure 4; Service 2008c). Critical habitat includes 12 herd units within portions of the Humboldt-Toiyabe, Inyo, and Sierra NFs and in Yosemite, Sequoia, and Kings Canyon National Parks. Ten of these herd units occur on the Inyo NF. Of these 10 herd units, approximately 278,805 ac (75 percent) occur on the Inyo NF. On the Inyo NF, approximately 262,948 ac (94 percent) occurs with designated Wilderness areas and much of the remaining acres occur in adjacent inventoried roadless areas.

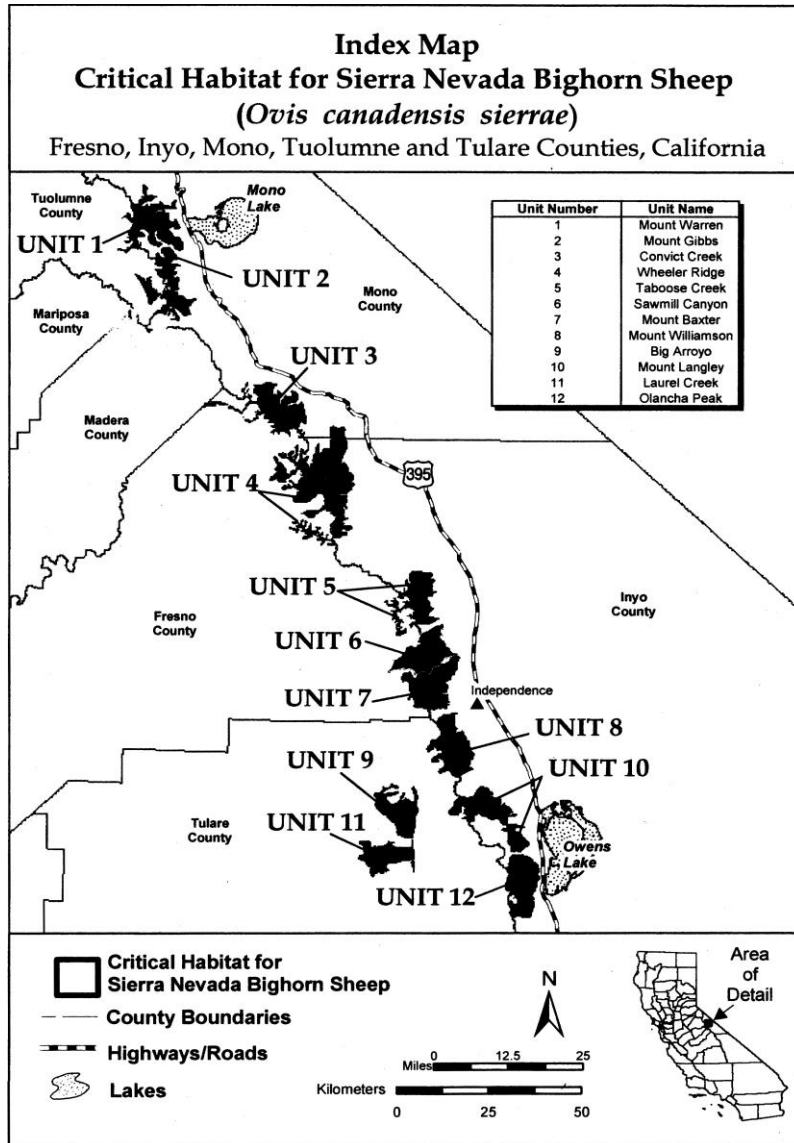


Figure 4. Critical habitat units for SNBS located in the action area [Mount Warren (#1), Mount Gibbs (#2), Convict Creek (#3), Wheeler Ridge (#4), Taboose Creek (#5), Sawmill Canyon (#6), Mount Baxter (#7), Mount Williamson (#8), Mount Langley (#10), and Olancho Peak (#12)] (Service 2008c).

The following primary constituent elements were identified with the critical habitat designation: (1) Non-forested habitats or forest openings within the Sierra Nevada from 4,000 ft to 14,500 ft in elevation with steep (greater than or equal to 60 percent slope), rocky slopes that provide for foraging, mating, lambing, predator avoidance, and bedding and that allow for seasonal elevational movements between these areas; (2) presence of a variety of forage plants as indicated by the presence of grasses (*e.g.*, *Achnanthera* spp.; *Elymus* spp.) and browse (*e.g.*, *Ribes* spp.; *Artemisia* spp., *Purshia* spp.) in winter, and grasses, browse, sedges (*e.g.*, *Carex* spp.) and forbs (*e.g.*, *Eriogonum* spp.) in summer; and (3) presence of granite outcroppings, containing minerals such as sodium, calcium, iron, and phosphorus that could be used as mineral licks in order to meet nutritional needs (Service 2008c).

ENVIRONMENTAL BASELINE

The environmental baseline is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat, and ecosystem, within the action area. The environmental baseline is a snapshot of a species' health at a specified point in time. It does not include the effects of the action under review in this consultation.

Status of the Species and Critical Habitat in the Action Area

The following information regarding the status of the LCT, PCT, OTC, SNBS, and SNBS critical habitat is taken almost entirely from the BA unless otherwise noted.

Lahontan Cutthroat Trout

Within the action area, LCT occur in one location, O'Harrel Creek. O'Harrel Creek is an approximately 2.0 mi discontinuous stream within the Owens River watershed in the Crowley Lake area and is an Out-of-Basin population (Figure 5). The creek occurs on a south-facing alluvial fan that has been incised, creating a small stream within the incision. The stream does not connect with the main stem of the Owens River, which isolates the population from brown trout and rainbow trout. In the Sierra Nevada Forest Plan Amendment (USFS 2001a), the USFS identified the 1,830 ac O'Harrel CAR to protect habitat for the LCT.

The LCT occupy the upper half of the wetted channel. This is because the amount of suitable habitat for LCT is limited to a 0.5 mi reach of stream with 0.2 mi of that occurring on LADWP land. Recent genetic analyses have confirmed that the LCT population on the Inyo NF was transplanted from Carson River populations (Peacock and Kirchoff 2007), but the exact contributing location is unknown.

Extensive watershed repair and restoration has been implemented along O'Harrel Creek since the 1960s. In 1999, the USFS implemented a habitat restoration project on its land. The USFS installed log sills along 1 mi of stream to raise the level of the stream within the incision and create plunge-pool habitat to increase habitat diversity within the stream. In 2001, it was noted that many of the structures associated with the habitat restoration project were failing; however, since then it appears that many of the log sills may have been successful at increasing habitat

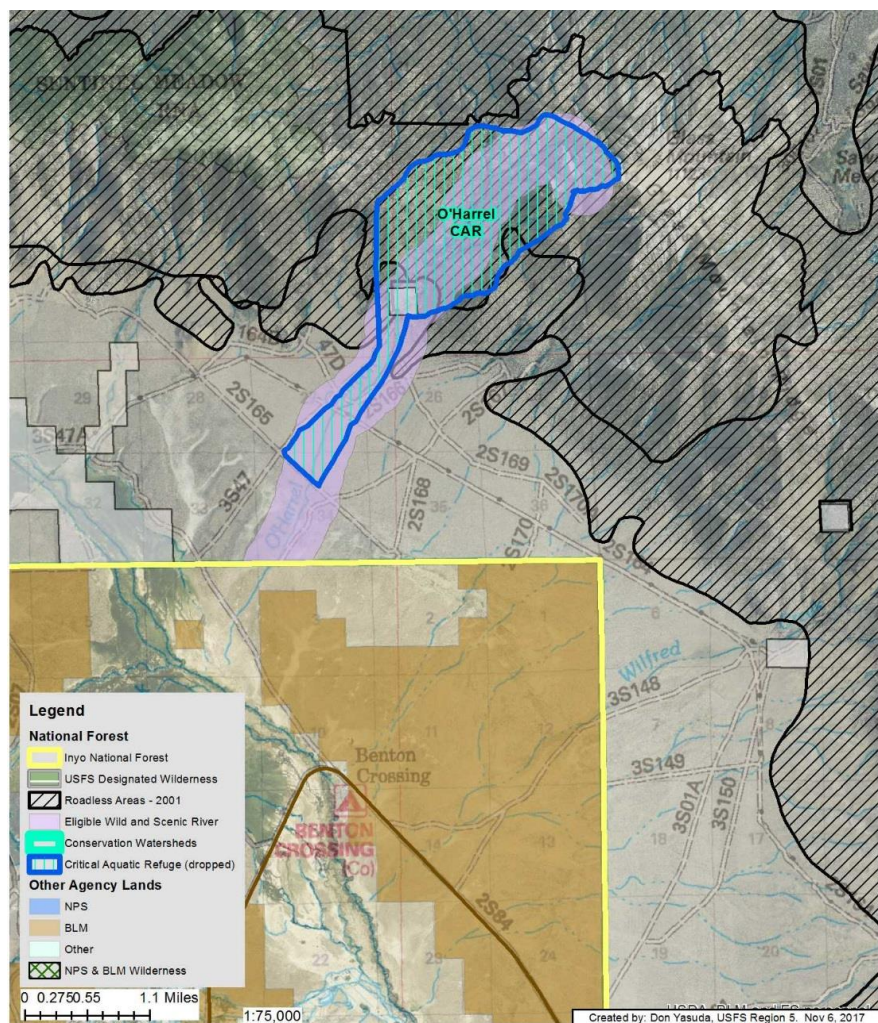


Figure 5. Location of the Out-of-Basin population of LCT in O'Harrel Canyon. This location was formerly designated as a CAR and is currently eligible for Wild and Scenic River status (USFS 2017).

availability as evidenced by the occurrence of pools occupied by LCT. Changing the grazing regime along this segment has had the most positive influence on riparian function by creating a dense vegetative component within the floodplain and stabilizing sediment deposited along the streambanks.

The number of LCT declined shortly after implementation of the habitat restoration project, but the numbers rebounded in 2005. The cause of the decline is unknown but it could possibly be accounted for by the late season timing of the survey when temperatures were high and LCT may have retreated to other portions of the stream above the “campsite”, which is located on LADWP land, where water is typically cooler and shadier. O’Harrel Creek typically exceeds 80 degrees Fahrenheit in the summer, with temperatures recorded at 90 degrees Fahrenheit, limiting available habitat for LCT. The LCT typically move upstream into the shady areas around the “campsite” location during these hot summer temperatures.

In 2007, the “Oharel” fire occurred at the top of the O’Harrel watershed. This fire may have contributed to a high volume of sediment that severely reduced the population. In the spring of 2008 and 2009, LCT were still observed in the stream, but they were difficult to find in 2010 and 2011. Photos from the area indicate an abundant sediment load after the 2010 spring run-off.

The CDFW monitors the population of LCT on the Inyo NF semi-annually using the Visual Encounter Survey protocol, validated by electroshocking every 5 to 10 years, when necessary. It is difficult to determine population trends from this limited annual survey data because population counts appear to fluctuate primarily due to water levels affected by climatic conditions such as snow pack and summer precipitation. In November 2011, the CDFW and USFS conducted an electroshocking survey but had poor results, capturing only one adult and four subadults. All LCT were captured just below the “campsite” area. The electroshocking survey in 2011 confirmed the reduction in numbers of this population. Since 2011, no official surveys have been conducted, although casual observations of a few LCT have been reported to the CDFW.

Paiute Cutthroat Trout

The Inyo NF supports two of the four self-sustaining Out-of-Basin stream populations of PCT: North Fork Cottonwood Creek and Cabin Creek. Both of these populations are located within the White Mountain Wilderness (Figure 6). The other two current Out-of-Basin populations are in streams located on the Sierra NF and are not considered in this BO.

The North Fork of Cottonwood Creek is a small, spring-fed brook that originates on the east slope of Paiute Mountain. It flows southeasterly for approximately 4.5 mi before merging with the South Fork to form Cottonwood Creek. Only one major tributary, Tres Plumas Creek, enters the North Fork of Cottonwood Creek approximately 1.0 mi above its mouth. In the North Fork of Cottonwood Creek, PCT occupy habitat in the uppermost 3.4 mi of stream above a 7 ft tall barrier, which is located just above the confluence with Tres Plumas Creek. In the Sierra Nevada Forest Plan Amendment (2001a), the USFS identified the 28,770 ac Cottonwood Creek CAR to protect habitat for the PCT (Figure 6). In 2009, the Cottonwood Creek Wild and Scenic River was designated and contains habitat occupied by PCT.

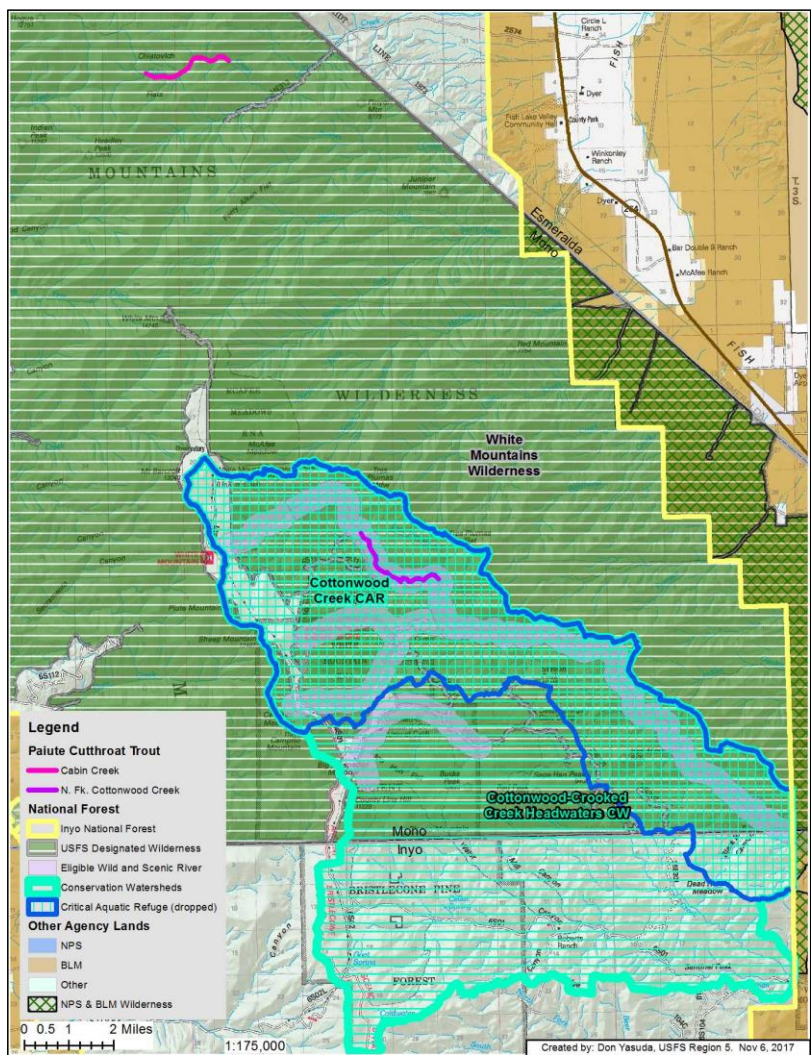


Figure 6. Location of the Cabin Creek and North Fork of Cottonwood Creek populations of PCT. This location was formerly designated as a CAR and is currently eligible for Wild and Scenic River status as well as a conservation watershed (USFS 2017).

Since 1989, the CDFW has surveyed the North Fork of Cottonwood Creek from Granite Meadow downstream to just above the Tres Plumas barrier (Service 2013). The results of these surveys indicate the population is stable, with numbers ranging from a low of 120 (in 2005) to a high of over 200 (1996 through 2004)(Service 2008b). Since the early 1970s, a fungal infection has been observed on the dorsal and caudal fins of spawned-out fish in the North Fork of Cottonwood Creek, which has resulted in post-spawning mortality. However, the population level effects are unknown. The CDFW attempted to develop a population index for the North Fork of Cottonwood Creek PCT population due to high electrofishing mortality and injury rates compared to other cutthroat trout populations. It is possible the high mortality rates had to do with the elevated pH of the stream, but the reason is ultimately unknown.

Management actions have been implemented to improve habitat for PCT. The exclusion of grazing since 1993 and spawning enhancement projects in 1995 and 1996, which created 51 spawning sites, appear to have increased PCT (Service 2004). More recent gravel enhancement work in 2007, prompted by the depressed population estimates in 2005, also created additional spawning sites throughout the 3 mi of habitat.

Occupied habitat in Cabin Creek is approximately 1.5 mi of stream habitat. In fall 2014, PCT were observed in Leidy Creek. A diversion has likely isolated Leidy Creek from rainbow trout located downstream. This may have removed the threat of PCT hybridizing with rainbow trout.

Surveys occurred on Cabin Creek in 1995, 2000, and 2009, but no trend was determined. During these surveys, there was a low of 139 PCT (in 1995) and a high of 186 PCT (in 2000). In 2009, PCT were observed throughout the stream, but no numbers were recorded due to time constraints and heavy willow growth (Service 2013).

Owens Tui Chub

There are two OTC populations located on the Inyo NF: Little Hot Creek Pond and Sotcher Lake. Sotcher Lake is outside the historical range of the species in Madera County in the heavily used Reds Meadow area just east of Devils Postpile National Monument (Figure 7). It is also within the proposed Mammoth Lakes Destination Recreation Area. In the Sierra Nevada Forest Plan Amendment (2001a), the USFS identified the 3,610 ac Little Hot Creek CAR to protect habitat for the OTC around occupied habitat in Little Hot Creek Pond and the headwaters to this pond (Figure 8).

There is a small portion of the settling ponds of the Hot Creek Fish Hatchery, where OTC also occur, that extend on to the Inyo NF. However, recent genetic testing by the CDFW has determined that these fish are introgressed with Lahontan Creek tui chub (Benjamin and Finger 2016).

As mentioned previously, there is no recent information on OTC abundance or changes in population size for these populations. The populations continue to persist at these locations; however, we are unable to determine whether they are increasing, decreasing, or stable.

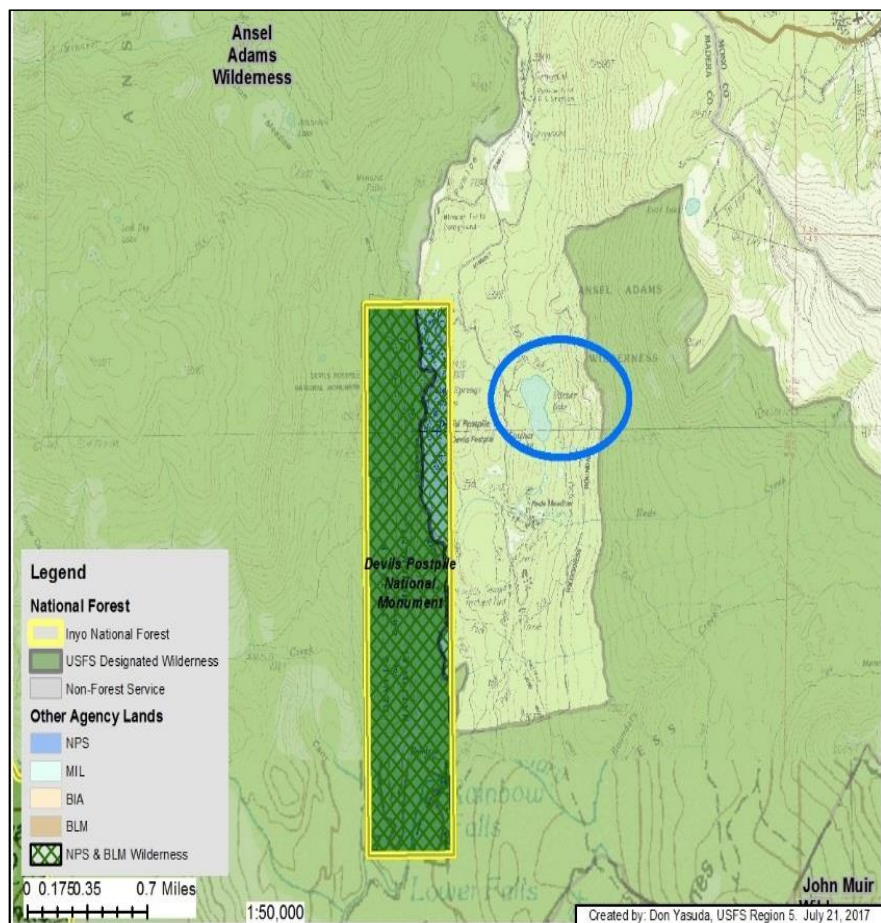


Figure 7. Location of the Sotcher Lake population of OTC, which is located outside of the historic range of the OTC (USFS 2017).

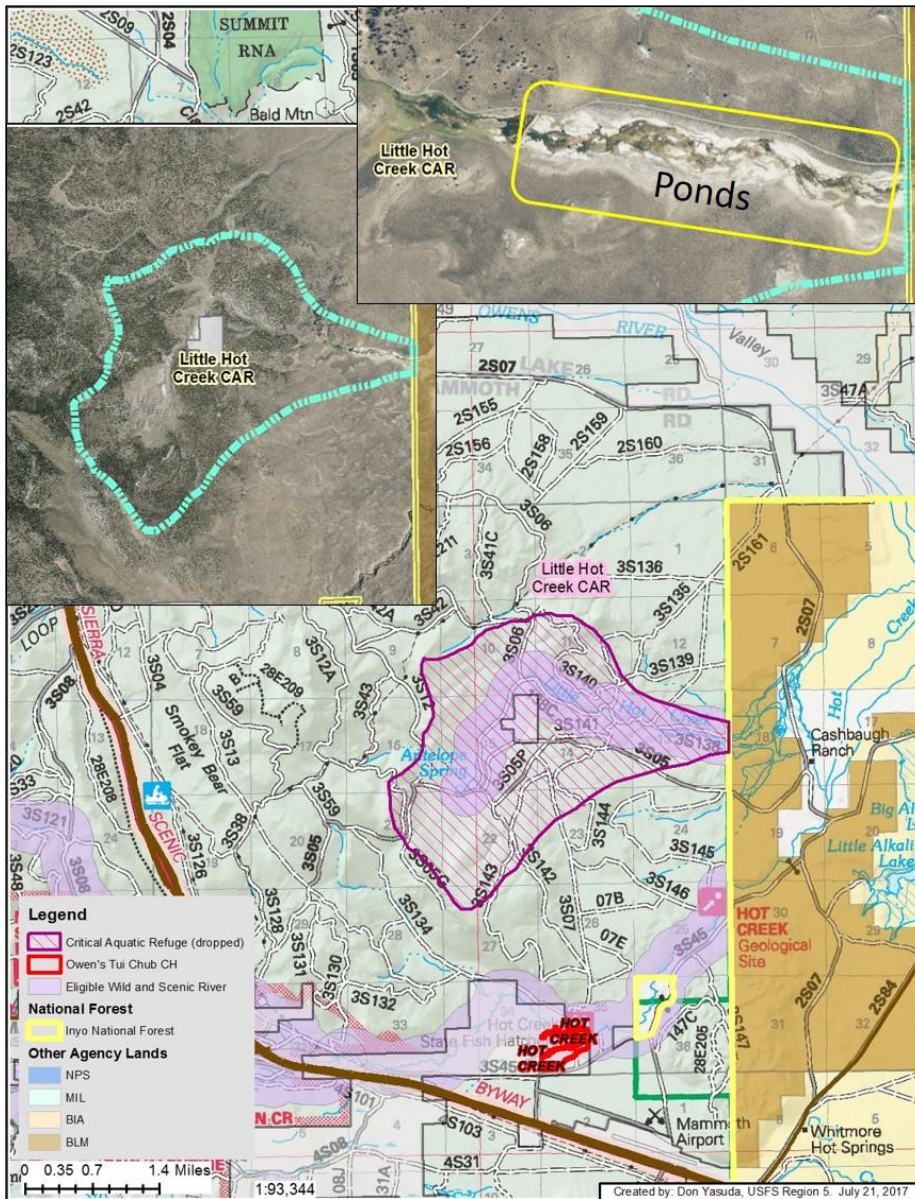


Figure 8. Location of the Little Hot Creek pond of OTC. Little Hot Creek is a former CAR. The with inset maps shows the occupied Little Hot Creek Pond and designated critical habitat (USFS 2017).

Sierra Nevada Yellow-legged Frog and Mountain Yellow-legged Frog

Populations of SNYLFs and MYLFs occur across the Inyo NF. The CDFW monitors SNYLF and MYLF populations in Aquatic Biodiversity Management Units (Management Units) as part of its High Mountain Lakes Project. On the Inyo NF, or lands administered by the Inyo NF, there are 18 Management Units (Figure 9). These Management Units include: Big Pine, Bishop Creek, Convict, Cottonwood, Coyote, Fish Creek, Goodale, Hilton-McGee, Independence, Lone Pine, Mammoth, Monache, Mono Lake, Mount Tom, Rock Creek, Rush Creek, San Joaquin, and Southern Owens. Of these Management Units, eight are occupied by SNYLF or MYLF (Big Pine, Bishop Creek, Independence, Monache, Mount Tom, Rock Creek, Rush Creek, and San Joaquin).

Sierra Nevada Yellow-Legged Frog

Populations of SNYLF occur in seven Management Units. These Management Units are Big Pine, Bishop Creek, Independence, Mount Tom, Rock Creek, Rush Creek, and San Joaquin.

The Big Pine Management Unit consists of Big Pine Lakes 6 and 7, Big Pine Lake 4 meadow, and Sam Mack Meadow. Only Sam Mack Meadow is occupied by SNYLFs, which is also negative for Bd. Big Pine Lakes 6 and 7 were part of a successful reintroduction project, but the population experienced a die-off from Bd in 2013. The CDFW is in the process of reintroducing SNYLFs into these lakes. As of 2016, there were no SNYLFs observed by CDFW at Big Pine Lake 4 meadow. All Bd tests through 2013 were negative.

The Bishop Creek Management Unit consists of Wonder Lakes and Treasure Lakes (3, 4, 5, 6, and 7). In the Bishop Creek Management Unit, SNYLFs occupy Treasure Lakes. In 2017, there was a Bd die-off at Treasure Lakes 3 and 4; surveys have detected tadpoles but few adult and juvenile frogs. Treasure Lakes 5, 6, and 7 are considered Bd negative, but will likely become Bd positive in the future.

The Independence Management Unit consists of Bench, Matlock, and Slim Lakes. These populations remain Bd negative.

The Mount Tom Management Unit consists of Gable Lakes (1, 2, 3, and 4) and Horton Creek. The Gable Lakes population is the largest population of SNYLF on the Inyo NF. The Horton Creek population is very small and limited to marginal habitat. The CDFW has removed fish from Horton Lakes 3 and 4 with the intent of establishing SNYLFs at these sites. Both of these populations are Bd negative.

The Rock Creek Management Unit consists of a small population in Birch Creek.

The Rush Creek Management Unit consists of Donahue Ponds, Rodger Lakes, Island Pass Lakes and ponds, and two lakes north of Island Pass. All four populations are Bd negative. These populations are made up of small, unnamed lakes or ephemeral ponds that are connected by sections of stream.

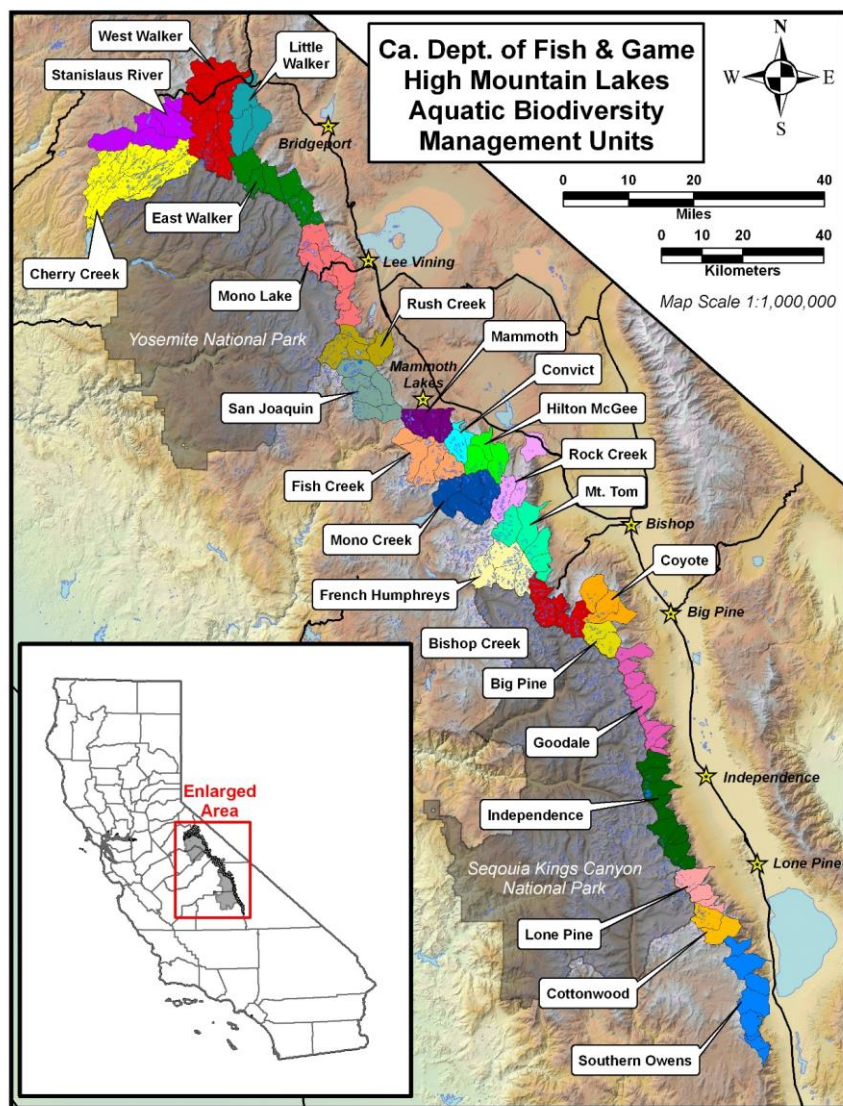


Figure 9. The CDFW monitors SNYLF and MYLF populations and identifies restoration projects in its Aquatic Biodiversity Management Units.

The San Joaquin Management Unit consists of Emerald Lake, Garnet Ridge Ponds, Banner Lakes, Garnet Lake Ponds, Minaret Meadow, Gertrude Lake, Anona Lake, Ashley Lake, and Holcomb/Noname Lakes. All of these populations are Bd positive.

Northern Distinct Population Segment of the Mountain Yellow-legged Frog

The Monache Management Unit (Subunit 5C: Mulkey Meadows) is the only one occupied by MYLFs on the Inyo NF. It consists of the Mulkey Creek and Bullfrog Meadow populations. The Mulkey Creek population is in an area grazed by cattle, and the stream habitat is occupied by fish. The Bullfrog Meadow population is very small and annual surveys by the CDFW often fail to detect individuals of any life stage. Both of these populations are Bd positive.

Yosemite Toad

On the Inyo NF, there are 22 sites, with 276 known YT locations. Yosemite toad populations occur in the higher elevations on the Inyo NF from the Lundy Canyon area south to the Piute Pass area. Of these 276 locations, 238 (or 86 percent) are located within designated Wilderness areas and 38 are found outside designated Wilderness. Specific information regarding each of these occurrences was included in the BA. As shown in (Figure 10), most known occurrences of YT are located within the following critical habitat units: Unit 5: Tuolumne Meadows/Cathedral; Unit 12: Silver Divide; and Unit 13: Humphreys Basin/Seven Gables. However, six occurrences are outside of critical habitat units. These six occurrences are Glass Creek Meadow (#1), Little Lakes Basin (#2), Rock Creek (#3), Glacier Lodge (#4), Lois Lake (#5), and Summit Meadow (#6).

Sierra Nevada Bighorn Sheep

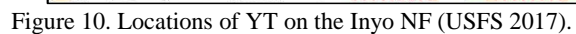
As of 2018, SNBS occur in 11 herd units (10 of which are considered essential herd units) and 3 recovery units located on the Inyo NF. These herd units are: Mt. Warren and Mt. Gibbs (Northern Recovery Unit); Convict Creek and Wheeler Ridge (Central Recovery Unit); and Taboose Creek, Sawmill Canyon, Mt. Baxter, Mt. Williamson, Bubbs Creek, Mt. Langley and Olancho Peak (Southern Recovery Unit). The other two essential herd units are located in the Kern Recovery Unit, which is located on the Sequoia and Kings Canyon National Parks (Greene, *in litt.* 2018).

Factors Affecting the Species and Critical Habitat within the Action Area

Below we discuss the factors that are affecting the species and, if appropriate, their designated critical habitat in the action area. The following information is taken directly from the BA.

Lahontan Cutthroat Trout

As discussed more thoroughly above for the species rangewide, factors that have influenced, and continue to influence, the decline in LCT include: (1) Nonnative species interactions (competition and hybridization); (2) factors that affect population viability such as habitat fragmentation/isolation and habitat availability/population size; (3) degraded habitat conditions from land use activities; (4) fire; and (5) climate change. The factors affecting the one Out-of-



Basin population of LCT in the action area is habitat degradation due to dispersed recreation activities and camping, and sedimentation from wildfires. Historically, livestock grazing occurred in this area, but all occupied habitat on the Inyo NF has been fenced to exclude livestock grazing.

Paiute Cutthroat Trout

As discussed more thoroughly above for the species rangewide, factors that have influenced, and continue to influence, the decline in PCT include: (1) Nonnative species interactions (hybridization, predation, and competition); (2) small, isolated populations; and (3) degraded habitat conditions from land use activities. The factors affecting the two populations of PCT in the action area include hybridization with introduced species, habitat fragmentation and isolation, and disease.

Nonnative rainbow trout are present downstream of the two PCT populations. However, there are currently barriers on the North Fork of Cottonwood Creek and Cabin Creek that isolate these two species.

The two PCT populations are small and currently occupy habitat less than that necessary to ensure their long-term persistence. The North Fork of Cottonwood Creek has approximately 3.4 mi of occupied habitat and Cabin Creek has approximately 1.5 mi of occupied habitat. As mentioned previously, to ensure long-term persistence, cutthroat populations should consist of more than 2,500 individuals, occupy at least 5.0 mi of habitat, and have no nonnative species present.

Land use activities in the action area also have the potential to affect habitat for PCT. Livestock grazing historically occurred in the action area in habitat occupied by PCT. In the 1990s, considerable effort was put into reducing sediment input into the North Fork of Cottonwood Creek, along with the suspension of grazing in the Cottonwood Creek and Tres Plumas Allotments in 2000. The grazing allotments are in non-use status but are not closed. If stream and riparian conditions can be maintained or continue to improve, future use of the allotments could be considered. The removal of livestock has resulted in stabilized streambanks and the re-establishment of willows; however, spawning substrate is still a limiting factor. Cabin Creek is located within the Cabin Creek Allotment. In 2010, grazing was authorized and is covered under an existing BO (File No. 2010-F-0088). However, the Cabin Creek area has not been grazed since 2005 due to restrictions in timing that is not compatible with the current grazing operation.

Other factors affecting the PCT in the action area include disease. Fungal disease already exists within the North Fork of Cottonwood Creek population, but the population continues to persist.

Owens Tui Chub

As discussed more thoroughly above for the species rangewide, factors that have influenced, and continue to influence, the decline of OTC include: (1) Nonnative species interactions (predation, hybridization, and competition); (2) habitat loss and modification; and (3) small, isolated populations that make them vulnerable to stochastic events and climate change. The factors affecting the two populations of OTC in the action area includes the loss and degradation of

habitat, predation and competition with nonnative species, and vulnerability to stochastic events and climate change due the small and isolated nature of existing populations. There is also the potential threat of hybridization with nonnative species.

Currently, most streams and rivers in the Owens Basin have been diverted and some impounded. Most of the water rights in the Owens Basin are owned by the City of Los Angeles. Currently, the demand for water from the Owens Basin is high and growing as Los Angeles continues to grow. The LADWP operates and maintains dams, diversion structures, groundwater pumps, and canals to capture and convey much of the water from the Owens Basin to Los Angeles. In addition to the increasing water demands for the greater Los Angeles area, areas adjacent to the Owens Valley (*e.g.*, Round, Chalfant, and Hammil Valleys) are growing, and the demand for water is growing. This increased demand has resulted in an increased withdrawal of ground and surface water from the Owens Valley Groundwater Basin, which affects springs and other surface waters in the Owens Basin (Pinter and Keller 1991). The remaining ground water, which provides water to isolated springs and springs that are the headwaters of streams in the Owens Basin, and surface water are used extensively for agriculture and municipal purposes in the Owens Basin.

There is no information to indicate that hybridization between the Lahontan Creek tui chub and OTC are an issue at Little Hot Creek Pond or Sotcher Lake. However, if man-made barriers isolating the OTC populations at Little Hot Creek Pond were degraded or removed, this degradation/removal could result in the loss of OTC.

Predation by introduced nonnative fish, specifically brown trout, has been a major threat to the OTC. Rainbow trout and brown trout exist within Sotcher Lake and continue to be stocked in that lake by the CDFW (ICF Jones and Stokes 2010). They are not present at Little Hot Creek Pond. Mosquitofish are abundant at Little Hot Creek Pond. It is known that mosquitofish will prey on small individuals of Mohave tui chub (*Gila bicolor ssp. mohavensis*), a similar species, but data are not available regarding their interaction with the OTC. Observations over time suggest that the OTC population at Little Hot Creek Pond appears to continue to persist in the presence of mosquitofish in this location.

Competition with nonnative fish species is also a threat to the OTC. Nonnative insectivorous fish occur at Little Hot Creek Pond (mosquitofish). A major part of the diets for these nonnative species is the same aquatic insects consumed by OTCs. There is little available information on the impact of competition on the OTC in the literature. However, mosquitofish are known to affect some southwestern native fishes through competition and predation (Deacon *et al.* 1964, Courtenay and Meffe 1989).

All of the factors described above affect the two small, isolated populations of OTC in the action area. Additionally, the habitat for the Little Hot Creek population is affected by emergent vegetation. At spring sites like Little Hot Creek Pond, invasive emergent plants (*e.g.*, cattail) can alter the aquatic habitat, resulting in a loss of open water and providing habitat for nonnative predators of OTC. The USFS and CDFW have evaluated potential management options for emergent vegetation at Little Hot Creek Pond, but no project has been initiated to date.

Sierra Nevada Yellow-legged Frog and Northern Distinct Population Segment of the Mountain Yellow-legged Frog and Critical Habitat

The SNYLF occurs in five subunits of critical habitat on the Inyo NF. These subunits are: Cathedral (3B), Minarets (3C), Mono Lake (3D), Evolution/Le Conte (3E), and Pothole Lakes (3F). The MYLF only occurs in one subunit of critical habitat on the Inyo NF, Mulkey Meadows (5C).

The primary factors that have influenced, and continue to influence the decline in the SNYLF and MYLF and/or its critical habitat in the action area include: (1) Habitat degradation and fragmentation due to land use activities; (2) predation and disease; (3) climate change; and (4) the interaction of these various stressors impacting small remnant populations. All of these threats act on the SNYLF and MYLF to varying degrees.

The two land use activities affecting the SNYLF and MYLF and their habitat in the action area include fish stocking (*i.e.*, fish introductions) and livestock grazing (only MYLF); although fish stocking with nonnative fish, which are predators of the SNYLF and MYLF, no longer occurs within the areas occupied by these species. In 2010, the CDFW and the Service analyzed and adopted direction for the management of the State's hatchery and stocking program (ICF Jones and Stokes 2010). That action adopted a process for addressing potentially significant stocking effects on sensitive, native, and legally protected fish and wildlife species and prohibits fish stocking where it conflicts with conservation goals of federal recovery plans or within federally designated critical habitat, which includes the SNYLF and MYLF. Although fish stocking has ended, there are many self-sustaining populations of nonnative fish populations that either limit existing SNYLF or MYLF populations or preclude their establishment.

There is no livestock grazing in any occupied habitats for the SNYLF on the Inyo NF. However, livestock grazing (*i.e.*, cattle) does occur in occupied habitat for the MYLF in the Mulkey Allotment around Mulkey Meadows.

Transmission of disease, especially chytrid fungus (Bd), is probably the greatest threat to the SNYLF and MYLF populations in the action area. *Batrachochytrium dendrobatidis* has been documented in almost all known populations within the action area.

Yosemite Toad and Critical Habitat

The YT occurs in three critical habitat units on the Inyo NF. These critical habitat units are: Tuolumne Meadows/Cathedral (Unit 5); Silver Divide (Unit 12); and Humphreys Basin/Seven Gables (Unit 13).

The primary factors that have influenced, and continue to influence, the decline in the YTs and/or its critical habitat in the action area include: (1) Habitat loss and degradation of meadow hydrology (*e.g.*, livestock grazing, fire suppression, recreation and packstock use); (2) disease; (3) predation; (4) climate change; and (5) the interaction of various stressors impacting small remnant populations. In addition to the above, pesticides, roads, and vegetation and fuels management may affect YTs and their habitat (including critical habitat) in the action area.

Currently, on the Inyo NF, there are no active grazing allotments within YT critical habitat units or in habitats occupied by YTs. Livestock grazing may occur in other portions of livestock grazing allotments and the USFS did not administratively close allotments.

Fire management, including suppression has occurred within the Inyo NF since the early 1900s and has resulted in an alteration of the fire regime with a longer fire return interval and subsequent increase in vegetation and fuels in some areas. This has led to an increase on many fires of higher fire severity effects when fires do occur and larger extent of fires where fuels have become more continuous. This effect has occurred slightly less in the higher elevations and remote areas where YTs occur due to naturally longer fire return intervals and sparser vegetation due to harsher conditions and shorter growing season. In addition, there is an emphasis to use minimum impact fire suppression techniques within wilderness areas when fires do occur, which has allowed some fires to burn more areas like they would have naturally.

Recreational activities, including packstock grazing, is widespread across the range of the YT, and generally has high overlap with the species and its habitats. On the Inyo NF, numerous areas within designated Wilderness areas have restrictions on the number of visitors with or without packstock. Commercial packstock have limited quotas as well. The USFS designed these restrictions to limit the impact on resources. Commercial packstock are allowed in occupied YT habitat but not until after the breeding cycle. There is currently an Order for Injunctive Relief (No. C-00-01237 EDL, May 8, 2008) that states that the USFS will prohibit all packstock grazing and entry in occupied YT breeding and rearing habitat throughout the breeding cycle (through metamorphosis). In addition, during the breeding and rearing cycle, the USFS will prohibit any packstock entry or grazing within 100 yards (yds) of any permanent water source within occupied YT habitat. Each year, the duration of the breeding and rearing cycle is estimated by the “wet” or “dry” year predictions from the California Department of Water Resources Bulletin 120. The packstock prohibition on entry into YT habitats begins 10 days before and extends 80 days after the estimated start of breeding based on the California Department of Water Resources Bulletin 120. An additional stipulation protects YT tadpoles if they are detected after the “on-date”. It states that if YT tadpoles are observed in a meadow, and this is confirmed by an aquatic biologist, then grazing will stop in all breeding and rearing habitat and up to 100 yds of any permanent water sources in that meadow until after metamorphosis is confirmed by an aquatic biologist.

While Bd has not been tested as extensively in YT as in the MYLF populations, Bd is present in many of the SNYLF and MYLF populations on the Inyo NF. Therefore, it is likely that Bd is prevalent throughout all populations of YT on the Inyo NF.

As mentioned above, fish stocking with nonnative fish no longer occurs within the areas occupied by YTs. However, there are some high-elevation waters where nonnative fish persist. Despite this, as discussed previously, direct mortality from fish predation is not consider an important factor driving YT population dynamics.

The USFS may apply pesticides locally in the portion of YT critical habitat outside of designated Wilderness near Lake Mary. In general, the USFS prohibits the application of pesticides within designated Wilderness areas. In this same area, several roads currently exist around Lake Mary, primarily to provide recreation access to developed campgrounds and trailheads. Within

developed campgrounds, a series of roads exist to individual campsites. Finally, vegetation and fuels management could also occur in the non-Wilderness portions of the critical habitat near Lake Mary.

Sierra Nevada Bighorn Sheep and Critical Habitat

As discussed more thoroughly above for the species rangewide, factors that have influenced, and continue to influence, the status of the SNBS in the action area include: (1) Predation; (2) disease; and (3) small, isolated populations, which makes them vulnerable to stochastic events. Of these, the primary threat to SNBS on the Inyo NF is disease. Other threats such as vulnerability to stochastic events due to small, isolated populations and predation occur in the action area. The CDFW manages the SNBS population to ameliorate the negative effects associated with small, isolated populations and predation by mountain lions.

Domestic sheep grazing continues to occur on allotments located within the action area. Although there is no domestic goat grazing within allotments managed by the USFS, recreational pack goat use is not a prohibited activity in the current LMP. Between 2000 and 2008, the USFS issued temporary or annual forest orders to restrict recreational pack goat use and free-running domestic dogs within identified areas within the range of the SNBS. In 2012, the USFS added a new category in the Wilderness permitting process used by visitors to better track goat packing. Since 2014, the USFS annually issues one to two Wilderness permits that include domestic pack goats, primarily for the months of July and August. In May 2018, the USFS agreed to initiate a Forest Closure Order, effective June 2018, restricting domestic pack goat use in high risk areas for SNBS.

The final rule designating critical habitat for SNBS identified several activities that may degrade the PCEs. These activities included those that: (1) Significantly reduce ongoing management and conservation efforts that benefit the SNBS on public lands (*e.g.*, the sale, exchange, or lease of lands managed by the USFS or other Federal agency); (2) significantly reduce the availability of or accessibility to summer and winter ranges (*e.g.*, grazing, mining, road construction); (3) result in the significant expansion of tall, dense vegetation, such as timber, within SNBS habitat, which could affect movement patterns of SNBS and provide cover for predators (*e.g.*, fire suppression); (4) create significant barriers to movement within and between habitats reducing the availability of habitat for foraging, breeding, reproduction, sheltering, rearing of offspring, affect dispersal and interaction between populations, or result in direct mortality (*e.g.*, road construction, resort or campground facility development or expansion); and (5) significantly degrade habitat or cause a disturbance to SNBS, which could impact the quality and quantity of foraging, displace animals from key foraging areas, escape terrain, breeding sites, or lambing areas, or result in negative impacts to body condition that could affect reproductive success (*e.g.*, recreational activities, such as hiking, camping, rock and ice climbing, outfitter guides and pack animal expeditions, snowmobiling, off-road vehicle use). Of the programs/activities described as part of the proposed action, fire suppression and recreational activities occur in the action area and are the most likely factors affecting designated critical habitat.

EFFECTS OF THE ACTION

The Service's regulations for implementing the ESA (50 CFR § 402.02) define effects of the action as the direct or indirect effects of an action on the species and/or critical habitat together with the effects of other activities that are interrelated and interdependent with that action, that will be added to the environmental baseline. Direct effects are the immediate, often obvious impacts of the proposed action on species and habitat that occur at the same time and place as the action. Indirect effects are impacts caused by or resulting from actions of specific projects and are later in time but reasonably certain to occur. In contrast to direct effects, indirect effects are not immediately apparent and may affect listed species populations and habitat quality over an extended period of time, long after an action has been implemented.

This section has been prepared in the absence of site-specific and spatially explicit information. In the context of the broad management direction provided in the revised LMP for six programs/activities (Fire Management, Vegetation and Fuels Management, Range Management, Recreation Management, Restoration Activities, and Roads and Infrastructure), the potential effects described in the BA, and the absence of detailed, site-specific information, this BO reflects the most conservative estimate of the range of effects that may be incurred by LCT, PCT, OTC, SNYLF, MYLF, YT, and SNBS and their habitats (including designated critical habitat) found within the action area. Due to the non-specific nature of the BA, only a general determination can be made of the effects on LCT, PCT, OTC, SNYLF, MYLF, YT, and SNBS and their habitats (including designated critical habitat) from the six programs/activities. Therefore, before these six programs/activities are approved, additional analysis and review is necessary to ensure compliance with the ESA.

Fire Management

The USFS determined that the Fire Management program has the potential to adversely affect LCT, PCT, OTC, SNYLF, MYLF, YT, and SNBS and their habitats. The Service is not analyzing the effects associated with wildfire suppression activities because this is an emergency action and not a foreseeable project/activity that the USFS would implement. The purpose of fire management is to manage naturally-ignited wildfires where and when the Inyo NF can do so safely and where the USFS expects fire effects to provide a positive benefit to resources. The Service is only considering how the USFS's identification of Strategic Fire Management Zones would affect land management in those areas and consequently, federally-listed species and their habitats.

During an emergency such as wildfire suppression, the USFS may initiate emergency consultation with the Service if federally-listed species and/or designated critical habitat may be affected. The initial stages of emergency consultation usually occurs within 48 hours of the start of the wildfire when the USFS contacts the Service for recommendations to minimize the effects of the emergency response action on federally-listed species and/or their designated critical habitat. If adverse effects to the species and/or designated critical habitat occur as a result of wildfire suppression activities, the USFS would initiate consultation with the Service after-the-fact.

In the BA, the Inyo NF identified four Strategic Fire Management Zones: Community Wildfire Protection Zone, General Wildfire Protection Zone, Wildfire Restoration Zone, and Wildfire Maintenance Zone. Each of these four Strategic Fire Management Zones overlap with habitat for LCT, PCT, OTC, SNYLF, MYLF, YT, and SNBS. The Wildfire Restoration and Wildfire Maintenance Zones primarily overlap with the habitat of LCT, PCT, SNYLF, MYLF, YT, and SNBS. The Community Wildfire Protection Zone overlaps with both OTC populations. The General Wildfire Protection Zone overlaps with the lower portion of the O'Harrel Creek population of LCT and a small portion of the Sotcher Lake population of OTC.

In the Community and General Wildfire Protection Zones, the USFS would prioritize vegetation and fuels management activities to lessen fire risk, and actively suppress fire to protect communities and other valuable assets. In these two zones, LTC and OTC would more likely be affected by vegetation and fuels management activities (discussed in the following section), and fire suppression activities. In the Wildfire Restoration and Maintenance Zones, the risks to valuable resources and assets are mixed and the USFS would evaluate each fire to determine the appropriate response; however, the intent is to restore fire to the landscape in these zones. In these two zones, LCT, PCT, SNYLF, MYLF, YT, and SNBS would more likely be affected by fire. The USFS expects the acres burned by naturally-ignited fires (which may or may not include fire suppression activities) would increase from approximately 11,300 ac per decade to 64,000 ac per decade under the revised LMP.

The potential effects associated with fire to LCT, PCT, OTC, SNYLF, MYLF, and YT could include harm, injury, or mortality due to increased sedimentation into aquatic habitat. Changes in vegetation can affect soil stability, erosion, and sediment loading into aquatic habitats. Sedimentation can result from disturbance of stream banks, activities in upland areas, or activities in upstream seasonal drainages. Exposed, unprotected soil has the potential to erode into aquatic systems, particularly with the season's first significant rain or during overland flows following snowmelt. This can result in a change to the hydrology of aquatic habitats for fish and amphibians.

The loss of vegetation due to fire may also result in changes in water temperatures. Water temperature can increase where riparian vegetation has been removed, increasing the amount of sunlight reaching the water. As water temperature increases, the amount of available dissolved oxygen for fish and aquatic invertebrates decreases. These impacts may result in stress, impacts to reproduction and growth, and reduced survival. In addition, the loss of vegetation can remove cover for these fish species and potentially increase predation.

Suspended sediments can also affect fish behavior, physiology, and habitat alteration, which may result in stress and reduced survival. The severity of effects from suspended sediment increases as a function of sediment concentration and exposure time or dose (Newcombe and Jensen 1996). Effects on fish behavior include avoidance of turbid water, altered territoriality, and changes in foraging behavior (Bisson and Bilby 1982, Berg and Northcote 1985). Physiological effects associated with increased levels of suspended sediment include gill trauma, oxygen intake, and ultimately impacts to reproduction and growth (Redding *et al.* 1987, Servizi and

Martens 1992). Increased sedimentation in streams can also affect fish populations through habitat alteration such as impacting foraging habitat including the benthic invertebrate community or reducing suitable spawning gravels as well as smothering eggs and fry.

A decrease or elimination of the amount and duration of shallow surface water in meadows could affect breeding by the YTs, or the decrease or elimination in perennial water utilized by the MYLF. Sedimentation can affect all life history stages of the amphibians by altering their habitat (Brown *et al.* 2014). High levels of sediment may fill deep pools used by the SNYLFs and MYLFs, and the shallow pools in meadows used by YTs, alter primary productivity, fill interstitial spaces in stream and lake bed materials with fine particulates, change flow characteristics, reduce dissolved oxygen, and restrict waste removal (Chapman 1988). Embedded substrate potentially reduces the amount and quality of refugia. Conversely, increased amounts of silt substrate and detritus also may provide cover for tadpoles and post-metamorphic life stages.

Direct fire-related mortality of adult amphibians is rare, either because of the timing of the fire or because individuals are able to take refuge from fire in burrows, moist ground, or water sources such as ponds (USFS 2013). The immediate effects of wildfire in the form of mortality of individuals and failed reproduction, is expected to be a small threat to most healthy populations, unless stressors such as drought or persistent habitat change have left populations isolated or with an extremely limited distribution (USFS 2013). The boreal toad (*Anaxyrus boreas boreas*), a species closely related to the YT, showed a positive response to fire events in western Montana (Bartelt 1998, Hossack and Pilliod 2011), colonizing recently burned wetlands and using severely burned forests more than moderately burned forests. The more severely burned areas had warmer surface and burrow temperatures even 3 years after the fire event (Hossack *et al.* 2009). Hossack *et al.* (2012) found a time-lagged decline in occupancy of the highly aquatic Columbia spotted frog (*Rana luteiventris*) associated with wildfire. Boreal toad occupancy tripled in the three years following wildfires and then returned to pre-fire levels. The indirect effects from fire on the amphibians includes the disturbance and destruction of habitat used as breeding, basking, refuge, and overwintering sites. Potential habitat alterations include changes to canopy and other vegetative and non-vegetative cover, air and water microclimates including temperature, water quantity and quality, hydro periods, increased nutrients, sedimentation, woody debris, and channel scour.

The reduction of canopy cover may benefit the amphibians by increasing the amount of available warm water and basking sites or may adversely affect them if temperatures increase higher than their thermal tolerances or if cover is not available. The importance of canopy cover may vary among streams, lakes, meadows, and other suitable habitats. Liang (2010) found adults associated with forest clearings. Currently, it is not known if a reduction in forest canopy cover in upland habitat is beneficial or detrimental to YT. The burrows, logs, tree roots, and stumps used for cover and refuge by the YT may be adversely affected by fire. This is especially true since adults have been found to have site fidelity to burrows (Liang 2010).

Wildfires are unlikely to directly result in the injury or mortality of SNBS. This is because SNBS tend to inhabit rocky areas with sparse vegetation. We also expect that if a wildfire did ignite near or adjacent to areas occupied by SNBS, they would be able to move out of the area to avoid the fire. The most likely effects to SNBS would be harm due to the loss or degradation of habitat,

resulting in injury or mortality. For example, wildfires may burn through key foraging areas, which could, in the short-term, reduce forage and potentially survival and reproduction. Conversely, fires may also create or improve habitat for SNBS by removing the overstory and increasing the amount of forage, removing cover for predators, or creating or improving connectivity between areas containing suitable habitat by removing encroaching vegetation.

The actual management strategy implemented by the USFS in response to wildfire will vary depending on what Strategic Fire Management Zone it is located in and risks to communities and other resources. There are some instances where the USFS will manage wildfires to meet resource objectives and restore and maintain fire as an ecological process. The revised LMP also includes standards and guidelines that avoid and/or minimize adverse effects to LCT, PCT, OTC, SNYLF, MYLF, YT, and SNBS, and their habitats. This includes standards and guidelines such as: minimize erosion; restore riparian areas and conservation watersheds in post-wildfire management activities; and allow fires to burn to improve riparian ecosystem function when the fire effects are expected to be within the natural range for the ecosystem.

Vegetation and Fuels Management

The USFS determined that vegetation and fuels management, as described in the BA, has the potential to adversely affect LCT, OTC, SNYLF, MYLF, YT, and SNBS, and their habitats. Although vegetation and fuels management is unlikely to occur in designated Wilderness where PCT occurs, we have included this species in our analysis. Prescribed fires would typically occur as part of this program. We described the potential effects to the species and their habitats associated with wildfires above. We will not reiterate those effects since they are similar to the effects that would occur in conjunction with prescribed fire activities.

The USFS would conduct vegetation and fuels management activities in conjunction with ecological restoration, hazard reduction, watershed restoration, and wildlife habitat enhancement. Restoration and wildlife habitat enhancement projects would primarily benefit the species and their habitats though short-term, adverse effects are possible. Other projects such as hazard reduction would reduce the risk of negative effects associated with wildfire. The extent to which each species would be exposed to the negative effects associated with vegetation and fuels management activities would vary. The USFS estimated that the number of acres of mechanical treatments to address vegetation and fuels would increase slightly under the revised LMP (20,000 ac per decade to 25,000 to 30,000 ac per decade) and acres of prescribed burn treatments would also increase slightly (18,000 ac per decade to 20,000 to 25,000 ac per decade).

The potential effects from vegetation and fuels management activities include harm, harassment, injury, and death. The most likely effects from these activities would be increased noise, vibration, dust, and ground disturbance from humans and equipment removing downed wood or vegetation for piling or burning; earthmoving; skidding; construction of permanent and temporary roads, skid trails, and landings; falling trees; and piling or burning. The harassment of LCT, PCT, OTC, SNYLF, MYLF, YT, and SNBS could occur to such a degree that they avoid or abandon suitable habitat and/or cease normal behaviors such as breeding, feeding, or

sheltering. Vegetation and fuels management activities could also result in the loss and degradation of habitat, as described above in the Fire Management section, such that it causes harm to the species and leads to their injury or death.

The Service anticipates that injury, mortality, and harassment of PCT, SNYLF, MYLF, YT, and SNBS would be unlikely because the majority of their habitat is located within designated Wilderness. Within designated Wilderness, most active, ground-disturbing management, such as direct vegetation management or prescribed burning, is inconsistent with maintaining the Wilderness character required by the Wilderness Act of 1964. However, LCT and OTC occur in areas located outside of designated Wilderness, and are also located entirely or partially in Strategic Fire Management Zones that prioritize vegetation and fuels management activities to lessen wildfire risk. In the case of LCT, its habitat is also eligible for Wild and Scenic River status. The revised LMP requires evaluation for consistency with the eligible Wild and Scenic River status. Consequently, the USFS would generally design any vegetation or fuels management projects to be of low intensity in order to maintain the scenery characteristics of a recreational class Wild and Scenic River. For OTC, vegetation and fuels management activities would most likely affect the population at Sotcher Lake. The population at Little Hot Creek Pond is not in a forested or heavily vegetated area, and fuels management activities would typically occur in the upland areas, which would not directly affect the shoreline or riparian habitats that might provide habitat for the OTC. In contrast, Sotcher Lake is within an area where there is a high level of recreation use. The Inyo NF does not expect to conduct vegetation management within this area during the life of the revised LMP though fuels management could occur in order to reduce the risk of negative wildfire impacts.

The effects to LCT, PCT, OTC, SNYLF, MYLF, YT, and SNBS from fuels management activities to reduce fire risk would be minimal because these species either occur in remote areas far from communities and infrastructure, in areas that are unlikely to be subject to these activities (OTC at Little Hot Creek Pond), or have additional restrictions that protect habitat (LCT in O'Harrel Creek). The Sotcher Lake OTC population is the only species likely to be affected by fuels management activities. Additionally, projects conducted under the Vegetation and Fuels Management program would benefit federally-listed species by improving their habitats (*e.g.*, restoration) or reducing the negative effects associated with wildfire. There would likely be short-term, adverse effects associated with these projects, but the revised LMP includes measures to either avoid and/or minimize adverse effects to LCT, PCT, OTC, SNYLF, MYLF, YT, and SNBS, and their habitats. For example, the revised LMP includes standards and guidelines such as: avoid adverse effects to water temperature; limit impacts from contaminants; limit disturbance to streambanks and shorelines; limit new skid trails and temporary roads in riparian conservation areas; provide for an equipment exclusion zone to limit soil impacts; and for interim management of USFS-identified eligible or recommended suitable rivers, use of interim protection measures identified in FSH 1909.12–84.3 (USFS 2015). The interim protection measures include guidance on proposed projects involving water resources, hydroelectric power facilities, minerals, transportation system, utilities, recreation development, motorized travel, vegetation management, and domestic livestock grazing.

Range Management

The USFS determined range management, as described in the BA, has the potential to adversely affect LCT, PCT, SNYLF, MYLF, YT, and SNBS, and their habitats. The revised LMP does not directly change the status or use on individual allotments and it does not substantively change current direction for livestock grazing. The USFS removed some protocol and process-related language from the current LMP, but this language was issued as supplemental implementation guidance so it can be kept more current as protocols improve with better knowledge.

The degree to which range management activities overlap with federally-listed species varies. Currently, there is no livestock grazing in habitat for LCT, PCT, OTC, SNYLF, and YT. All LCT habitat around O'Harrel Creek is fenced to exclude livestock grazing. In PCT habitat, around the North Fork of Cottonwood Creek, the Cottonwood Creek and Tres Plumas Allotments are in non-use status. The Cabin Creek area has not been grazed since 2005. The USFS did not analyze the effects of range management activities on OTC and its habitat because these activities are unlikely to occur in areas occupied by OTC. The Inyo NF has also discontinued livestock grazing in habitat occupied by SNYLF and YT. The one exception is the Mulkey Allotment in the area around Mulkey Meadows, which is occupied by the MYLF. Many of the allotments on the Inyo NF in SNBS habitat, which were more commonly grazed by domestic sheep, are vacant or closed to domestic sheep grazing due to the potential for disease transmission between these two species. The allotments that do overlap with SNBS habitat are grazed by cattle.

While livestock grazing does not currently overlap with habitat for LCT, PCT, OTC, SNYLF, and YT, the Service recognizes that this could change over the life of the revised LMP. For this reason, in the following paragraphs, we discuss the potential effects associated with range management as it applies to all of the federally-listed species and their habitats.

Livestock may trample LCT, PCT, OTC, SNYLF, MYLF, and YT resulting in their injury or death, or displace them from suitable habitat. Redds, eggs (fish and amphibian), tadpoles, and fry are most vulnerable to trampling and disturbance from livestock. Juvenile SNYLFs, MYLFs, and YTs could also become entrapped in deep hoof prints. Livestock can step on all life stages of amphibians (adults, juveniles, metamorphs, and tadpoles) while accessing water along streambanks, lakeshores, or meadows, or while foraging for riparian vegetation in these habitats. The SNYLF and MYLF are relatively more mobile than YTs, especially the adults and subadults. Tadpoles of SNYLF and MYLF also generally occur in habitats with more continuous and deeper water. This makes it easier for all life stages of SNYLFs and MYLFs to escape from livestock whereas YTs are more likely to be stepped on. However, all life stages commonly bask in shallow areas or on stream and lake banks, and are vulnerable to trampling by cattle utilizing these habitats to drink water, cross through habitats (*e.g.* streams), or forage on emergent or shoreline vegetation.

However, the mostly likely affects associated with range management would be the degradation of habitat or displacement of LCT, PCT, OTC, SNYLF, MYLF, and YT from suitable habitat. The following paragraphs describe how livestock grazing may degrade aquatic habitat and the potential effects to these species.

Livestock grazing could degrade aquatic habitat for LCT, PCT, OTC, SNYLF, MYLF, and YT resulting in potential injury or mortality of these species. Livestock tend to concentrate along streams and wet areas where there is water and herbaceous vegetation; grazing impacts are, therefore, most pronounced in these habitats (Meehan and Platts 1978, Fleischner 1994, Menke *et al.* 1996). Grazing of livestock in riparian areas impacts the function of the aquatic system in multiple ways, including soil compaction, which increases runoff and decreases water availability to plants; vegetation removal, which promotes increased soil temperatures and evaporation rates at the soil surface; and direct physical damage to the vegetation (Kauffman and Krueger 1984, Cole and Landres 1996). Streamside vegetation protects and stabilizes streambanks by binding soils to resist erosion and trap sediment (Kauffman *et al.* 1983, Chaney *et al.* 1990).

Streambank damage can reduce or eliminate fish habitat associated with banks (Armour 1977, Kauffman *et al.* 1983, Matthews 1996), alter stream morphology such as pool/riffle and width/depth ratios (Gunderson 1968, Platts 1979, 1991, Overton *et al.* 1994, Myers and Swanson 1995, Knapp and Matthews 1996, Lyons *et al.* 2000), and cover spawning areas with sediment which reduces survival of fish embryos (Phillips *et al.* 1975, Myers and Swanson 1996a, b, Wood and Armitage 1997). In some areas of the affected allotments, particularly in meadows, hoof shear led to bank collapse, removing a habitat component important to trout. Increased sedimentation due to this collapse may decrease pool volume downstream, eliminating other important habitat (Duff 1983, McIntosh *et al.* 2000). Cattle grazing in watersheds supporting listed aquatic species could increase predation of fish by birds and mammals because of the effect the cattle have on streambanks. Channels become wider, shallower, and cover is eliminated on the banks and within the channel. Fish are more exposed and vulnerable to predation due to lack of escape cover.

Concentration of livestock contributes to the destabilization of streambanks, causing undercuts and bank failures (Kauffman *et al.* 1983, Marlow and Pogacnik 1985, Moyle *et al.* 1996, Knapp and Matthews 2000). Mass erosion from trampling and hoof slide causes streambank collapse and an accelerated rate of soil transport to streams (Meehan and Platts 1978). Excess sediment introduced into streams can adversely affect fish populations by inducing embryo mortality, affecting primary productivity, and food supply. Deposition of silt on spawning beds can fill interstitial spaces in stream bed material, impeding water flow, reducing dissolved oxygen levels, and restricting embryo waste removal (Chapman 1988, Bjornn and Reiser 1991). Suspended sediments reduce light penetration to plants and reduce oxygen carrying capacity of the water (Ohmart and Anderson 1982). Reduction in photosynthesis and primary production decreases productivity of the entire ecosystem (Minshall *et al.* 1989). Additionally, sedimentation directly decreases the amount of substrate suitable for macroinvertebrates (Strand and Merritt 1999) and reduces instream cover for fish (Waters 1995).

Livestock grazing and associated activities may alter the hydrology of meadows, streams, and other aquatic habitats used by SNYLFs, MYLFs, and YTs, exposing them to predators or altering habitat such that it does not allow these individuals to survive. Grazing within MYLF habitat has been observed to remove vegetative cover, potentially exposing frogs to predation and increased desiccation (Jennings 1996, Knapp 2005), and to lead to erosion which may silt in ponds and thereby reduce the water depth needed for overwinter survival (Knapp 2005). Livestock grazing may also affect multiple interrelated processes that may ultimately result in

less available aquatic habitat that dries more quickly during the summer. Heavy trampling by livestock can compact soils, which may reduce the infiltration of overland flows and precipitation. Reduced infiltration and increased runoff may decrease the recharge of the saturated zone in meadow and riparian habitats. Livestock grazing can reduce the abundance of protective vegetation, destroy peat layers in meadows, and accelerate streambank erosion, which can lead to downcutting of stream channels and lowered water tables. Downcut channels become confined within narrow, incised channels and are no longer connected to their historical, meadow floodplains. As water tables fall in meadows, their water storage capacity lessens, and they become less suitable for riparian vegetation, which may be supplanted by drought-tolerant communities. Acceleration of erosion and gulying of meadows resulting from overgrazing (Kattelman 1996 as cited in Service 2013) may lead to increased siltation and more rapid meadow succession ultimately resulting in faster meadow drying and encroachment of conifers into meadows (Service 2013). In some cases, formerly perennial streams may become intermittent (Service 2013). These interrelated processes which result in lowered water tables, reduced inundation of flood plains, and faster drying can lead to reduced amounts of surface water that may not remain for sufficient time periods to provide for the ecological requirements of the three listed amphibians.

The wet soil associated with aquatic habitats such as wet meadows, lake shores, and streambanks are particularly vulnerable to trampling by livestock (Marlow and Pogacnik 1985 as cited in Brown *et al.* 2009, Brown *et al.* 2014). Livestock trampling may alter the shallow breeding areas used by the YTs or the shallow shoreline microhabitats in lakes and streams preferred by the MYLFs and the YT. Pock-marking and soil compaction can result from cattle walking in and trailing through breeding sites in wet meadows, stream crossings, and lakeshores. Pock-marks can isolate YT tadpoles into smaller pools as meadows dry (USFS 2012) and inhibit metamorph movements. Pock-marks can be moderated by natural freeze and thaw cycles over a period of 5 to 10 years when rested from grazing (Menke *et al.* 1996, USFS 2012, 2014).

Activities associated with the management of allotments such as the maintenance of allotment structures (*e.g.*, fences, corrals, permanent and temporary camps), herding or monitoring livestock by foot or horseback, keeping horses in areas adjacent to aquatic habitat, maintenance of stock trails, and the operation of vehicles to support allotment operations may also degrade aquatic habitat resulting in the injury and mortality of individuals through effects similar to those described above. For example, the YTs may be more vulnerable to these activities than the more aquatic MYLFs because it uses meadow and upland habitats away from water. Similar to those described for livestock above, these activities may injure or kill individuals by trampling, crush or collapse YT burrows, which could result in entrapment or mortality, or affect behavior through disturbance. In contrast, various rangeland management practices associated with the management of allotments may reduce the likelihood of potential effects to LCT, PCT, OTC, SNYLF, MYLF, and YT. Grazing systems, forage utilization, and streambank alteration standards can influence the amount of time that livestock are allowed to linger in a particular area, which would reduce impacts to habitat and the associated negative effects to individuals. Range improvements like fences, water developments, and salting as well as other techniques like herding may be used to distribute livestock away from areas where interactions with these

species are more likely to occur. Additionally, the construction of new facilities outside of occupied habitat would avoid or minimize impacts to habitat and thus, avoid or minimize the injury and mortality of individuals.

Currently, there is no livestock grazing in LCT, PCT, OTC, SNYLF, and YT habitat. The revised LMP also does not change the status or use on individual allotments or substantively change current direction for livestock grazing. It does include guidance in the form of desired conditions, guidelines, and standards for LCT, PCT, OTC, SNYLF, MYLF, and YT which benefit and/or protect the species and their habitats. This includes designing land management activities to maintain or enhance self-sustaining populations of at-risk species; if appropriate, incorporating habitat management objectives and nonhabitat recovery actions from approved recovery plans into projects that occur within the habitat of federally-listed species and contribute to recovery; and limiting streambank disturbance from livestock to 10 percent of occupied stream reaches occupied or identified as essential habitat stream reaches in recovery plans for LCT or PCT, and requiring corrective action where streambank disturbance limits have been exceeded.

Additionally, the revised LMP also includes standards and guidelines that would protect habitat for LCT, PCT, OTC, SNYLF, MYLF, and YT such as: prohibiting new livestock handling facilities and stock driveways, salting, and supplemental feeding in meadow and riparian locations; when reissuing permits for livestock, evaluating impacts of facilities on the riparian conservation areas and considering relocating existing livestock facilities outside of meadows and riparian areas; resting recently burned areas if recovery of desired vegetation condition and related biophysical resource are necessary; assessing the hydrologic function of riparian areas, meadows, fens, and other special aquatic features during rangeland management analysis; and ensure that characteristics of special features are, at a minimum, at proper functioning condition or functioning-at-risk and trending toward proper functioning condition, as defined in appropriate technical reports. In habitat occupied by PCT, if stream and riparian conditions improve, the Inyo NF could consider future livestock use of the allotments, but it would use the appropriate conservation measures. In the Cabin Creek area, the USFS would manage livestock according to an existing BO (File No. 2010-F-0088).

The major threat to SNBS from livestock grazing is disease transmission from domestic sheep and goats. As discussed in the Status of the Species section for SNBS, studies have demonstrated that pathogens causing pneumonia can be transmitted from domestic sheep and goats to bighorn sheep though outbreaks are much more severe when contact occurs with domestic sheep. The overall effect respiratory disease has within bighorn sheep populations varies from mild outbreaks that cause illness, but do not result in high adult mortality, to severe outbreaks that result in high mortality (greater than 50 percent) across all age classes. Following these outbreaks, mild or severe, populations may experience low recruitment due to lamb mortality and low juvenile survival (Cahn *et al.* 2011). Currently, there are no domestic sheep grazing allotments located in SNBS habitat. In the revised LMP, the USFS commits to continue: (1) Using the best available information to minimize the risk of disease transmission from domestic sheep and goats to SNBS to the maximum extent practicable; (2) not allowing domestic sheep and goats where the best available information shows there is a high risk of contact between domestic sheep, goats, and SNBS, and thus, a high risk of potential disease transmission; and (3) recognizing that domestic sheep and goats are not suitable in areas where the best available information indicates there is a high risk of contact between domestic sheep,

goats, and SNBS. The USFS also continues to coordinate with the Service and CDFW to evaluate the risk of potential contact between SNBS and domestic sheep and goats, and it has closed portions of active livestock grazing allotments to domestic sheep grazing where there was a high risk of contact between SNBS and domestic sheep.

Lesser, indirect threats to SNBS from cattle grazing could include the displacement of individuals (King and Workman 1984, Bissonette and Steinkamp 1996, Brown *et al.* 2010), increased risk of disease transmission (Robinson *et al.* 1967, Clark *et al.* 1993, Foreyt and Lagerquist 1996, Singer *et al.* 1997, Noon *et al.* 2002, Wolfe *et al.* 2010), and increased competition for forage (Brown *et al.* 2010). While cattle grazing allotments do overlap with suitable habitat for SNBS, it is unlikely that cattle and SNBS use the same areas. As discussed in the Status section for SNBS, SNBS are not attracted to cattle as they are to more closely related species such as domestic sheep, which decreases the likelihood of the two species coming into contact with each other and transmitting diseases. Therefore, the displacement of individuals, risk of disease transmission, and competition for forage is likely insignificant.

Recreation Management

The USFS determined recreation management has the potential to adversely affect LCT, PCT, OTC, SNYLF, MYLF, YT, and SNBS, and their habitats. The degree to which recreation management activities would affect each species would vary. In designated Wilderness, where PCT, SNYLF, MYLF, YT, and SNBS primarily occur, there is likely low levels of non-motorized recreation. Sotcher Lake, where one population of OTC occurs, likely receives heavy use since it is a popular recreation site. The population of LCT in O'Harrel Creek is in a relatively remote location but may receive moderate levels of recreation though this primarily occurs upstream of USFS land.

Generally, studies of the impact of recreational use, specifically camping, in designated Wilderness and national parklands in the western United States have found that recreation creates considerable impact rapidly with light use, whereas recovery of these areas occurs only after lengthy periods of no use (Cole and Fichtler 1983, Cole 1986, Stohlgren and Parsons 1986, Cole and Marion 1988). Establishment of trails and camps disturbs vegetation and soil structure, resulting in changes in habitat structure and microclimate (Foin *et al.* 1977, Boyle and Samson 1985, Knight and Cole 1991). These activities as well as dispersed camping and other activities that occur near high-elevation meadows, ponds, lakes, and streams can result in increases in erosion and sedimentation, bank trampling, and vegetation disturbance. Heavy recreational use can mimic damage to vegetation and soils caused by overgrazing (Obedzinski *et al.* 2001). Three Wilderness areas studied in the western United States concluded that the impacts on campsites used for less than 10 nights per year had already reached a threshold beyond which further increases in use had little effect on the severity of impacts. These impacts included loss of vegetation cover, soil compaction resulting in slowed infiltration rates, and pronounced increases in soil pH, organic matter content, and nutrient content (Cole and Fichtler 1983). Recreation activities would more likely affect LCT and OTC. The effects from recreation activities would

have similar impacts to LCT and OTC, and their habitats as those described above in the Range Management section. We discussed many of these effects above; therefore, we will not reiterate those effects here.

In addition to the effects described above, wastes from humans and packstock may also introduce other water pollutants such as nitrogen that can result in algal blooms, decreased oxygen content, and increased water temperatures. This can affect egg, larval, and other life stages of fish species. People and animals (pets, packstock, *etc.*) may also wade along streams or lake shores, or walk within or near aquatic habitat. This could result in the harassment, injury, or mortality of LCT, PCT, OTC, SNYLF, MYLF, and YT. While LCT, PCT, OTC, SNYLF, and MYLF may disperse out of the immediate area in response to the presence of humans or packstock. This may expose them to predators. Other life stages such as eggs, tadpoles, and fry may be crushed, resulting in their injury or mortality. The YT, which moves much slower, is more likely to be crushed and injured or killed. This is especially true for smaller subadults. In upland habitat, YTs may also be hidden in burrows or under downed wood. These behaviors (*i.e.*, slow movement, seeking cover in burrows or under downed wood) make them more vulnerable to being crushed by humans or packstock, which could result in their injury or death. Yosemite toads have also been found on hiking trails, under campfire rings in remote areas being actively decommissioned, and in burrows associated with rocks that line roads to developed campsites. Examples of direct mortality, injury, or harassment include observations of trampling of SNYLF larvae and juvenile frogs by packstock (V. Vredenburg, pers. comm., 2002 as cited in USFS *et al.* 2014). In addition, the USFS *et al.* (2015) documented the trampling, handling, and other disturbance of western toad (*Anaxyrus boreas*), a species closely related to the YT, egg masses, tadpoles, and metamorphs by humans and pets. Rodriguez-Prieto and Fernandez-Juricic (2005) found that Iberian frog (*Rana iberica*) abundance decreased with proximity to recreational activities and that the time frogs spent in refugia was affected by the amount of human activity, which suggests these effects are possible for the amphibian species, as well. Trash and other debris left by humans may also attract predators to the area. Trash cans serve as an attractant to common ravens, which prey on YT.

The routine maintenance of existing and construction of new USFS facilities is not likely to cause habitat loss for most of these species because there is little overlap between them and the species' habitat. However, activities associated with the routine maintenance of existing or construction of new USFS facilities could affect SNYLF and YT where these activities overlap with them in habitat located outside of designated Wilderness. One specific example is the USFS' application of pesticides around Lake Mary, which is located outside of designated Wilderness. In general, the USFS prohibits the application of pesticides within designated Wilderness areas. In this same area, several roads currently exist around Lake Mary, primarily to provide recreation access to developed campgrounds and trailheads. Activities could affect cover, hydrology, water quality, and sedimentation in surrounding areas, or result in the displacement, injury, and death of individuals. The maintenance of facilities, or construction of new facilities, may affect the availability and quality of water. For example, water may be diverted or used for purposes such as drinking water. Water storage facilities may serve as habitat for invasive species such as bullfrogs or crayfish. Water quality may be affected by Special Use Permit activities associated with existing infrastructures such as campgrounds, work centers, and ski areas. Maintenance of developed recreation and infrastructure sites, including new construction, that require earth moving or soil disturbance could cause erosion that can

increase siltation and sedimentation into aquatic habitats or meadows. Sedimentation can alter the morphology of aquatic habitats, such as filling in pools in streams and creeks, and reduce cover by filling interstitial spaces in stream, creek, and lake substrates. Sedimentation could also modify meadow breeding habitat used by YTs. The clearing of vegetation as part of routine maintenance or new construction may affect adult YTs if they use surrounding upland habitat. Equipment and human activity associated with vegetation clearing and other routine maintenance or new construction also may destroy or alter cover components such as burrows, logs, tree roots, or stumps located in upland habitat for YT. These activities may also result in a decrease in vegetative cover along stream and lake shores and in meadows, which would affect the fish and amphibian species. Rocks, wood, and other cover used by the amphibian species could be dislodged or removed. Rodent burrows, rocks, logs, or tree stumps used by the YT as refugia may be crushed, moved, or altered.

Recreational activities may also alter the hydrology of lakes, meadows, and creek or stream habitats potentially resulting in their degradation or drying. Shallower aquatic systems such as those found in wet meadows and small streams are more vulnerable to hydrologic impacts than deeper lakes. Recreational infrastructures such as developed campgrounds and dispersed activities such as hiking, camping, or use of packstock can compact soil, increase runoff and erosion, alter vegetation, modify pool mudflats, and trample stream banks and lakeshores. These effects can divert water, result in downcutting, and lower water tables, which may then result in a reduction or elimination of habitat for the fish and amphibian species. Yosemite toads breed in very shallow water habitats within meadows or lakes and a certain amount of mortality of eggs and tadpoles occurs naturally from desiccation and freezing. Given this natural vulnerability, any changes that result in decreased amounts and shorter persistence of the species' preferred shallow water breeding habitats may reduce reproductive success and recruitment, and ultimately the persistence of populations. Mountain yellow-legged frogs are highly aquatic, require perennial water for their multi-year tadpole stage, and generally require water that does not freeze to the bottom in winter or completely dry during the summer. Thus for SNYLFs, MYLFs, and YTs, hydrological changes that result in shallower water or desiccation may reduce reproductive success and recruitment, survival of all life stages, and ultimately the persistence of populations.

Those species that occur in designated Wilderness, where activities consist of non-motorized recreation (*e.g.*, horseback riding, backpacking, hiking, backcountry skiing), likely receive low-levels of dispersed travel by individuals and small groups of people. This travel would likely be confined to established trails and areas adjacent to trails but some off-trail, dispersed recreation would also occur. These activities could be detrimental if it displaced PCT, SNYLF, MYLF, YT, or SNBS from suitable habitat used for breeding, feeding, and sheltering. However, these activities are of short duration and dispersed across the landscape making it unlikely that they would disturb or displace PCT, SNYLF, MYLF, YT, or SNBS such that it would result in their injury, death, or harassment.

As discussed in the Status section for SNBS, domestic goats can also carry various pathogens including *M. haemolytica* and *M. ovipneumoniae*, which can cause pneumonia in bighorn sheep. Current research suggests the goats infected with *M. ovipneumoniae* transmitted the pathogen to bighorn sheep; however, while bighorn sheep exhibited symptoms of respiratory disease, there were no fatalities (Besser *et al.* 2017). Conversely, an outbreak of infectious keratoconjunctivitis and contagious ecthyma in bighorn sheep in the Silver Bell Mountains due to contact with

domestic goats did result in mortality of bighorn sheep. The severity of disease transmitted by domestic goats is an area of active research. However, current information indicates that domestic goats can transfer pathogens associated with lethal respiratory disease to bighorn sheep, which highlights the need to minimize contact between these species. Domestic goats can currently be used as pack goats on the Inyo NF. In the revised LMP, the USFS commits to continue: (1) Using the best available information to minimize the risk of disease transmission from domestic goats (including pack goats) to SNBS to the maximum extent practicable; (2) not allowing domestic goats (including pack goats) where the best available information shows there is a high risk of contact with SNBS, and thus, a high risk of potential disease transmission; and (3) recognizing that domestic goats (including pack goats) are not suitable in areas where the best available information indicates there is a high risk of contact with SNBS.

Recreation management activities would likely have a limited effect on LCT, PCT, SNYLF, MYLF, YT, and SNBS because these species occur in designated Wilderness (where there is little to no recreation-based infrastructure and low levels of dispersed recreation) or in areas where there are no plans to develop infrastructure. The one exception for YT is in the Lake Mary area. The Sotcher Lake population of OTC is located in an area that receives a high level of recreational use. We do not have any information to determine to what degree individuals at this location may be affected by recreational activities; however, it is likely the effects described above do result in some level of injury, morality, and harassment. In the revised LMP, the USFS included standards and guidelines to avoid and/or minimize adverse effects. This includes avoid locating new recreation facilities within environmentally and culturally sensitive areas, such as at-risk species breeding habitat or at-risk plant species habitat; use integrated resource planning when designing projects to address impacts to at-risk species habitat and changing conditions in recreation settings; limit party size and number of stock per party to a level that protects social and natural resource values; limit pesticide applications where project-level analysis indicates that pesticide applications are consistent with riparian conservation areas desired conditions; design applications to avoid adverse effects to amphibian species and their habitats when pesticide application is proposed within 500 ft of known occupied sites; and, in most cases, apply pesticide by hand application with buffers around aquatic features to mitigate impacts to riparian resources. For the interim management of USFS-identified eligible or recommended suitable rivers (where LCT occurs), the USFS will use interim protection measures identified in FSH 1909.12–84.3 (USFS 2015). These interim protection measures include guidance on proposed projects involving water resources, hydroelectric power facilities, minerals, transportation system, utilities, recreation development, motorized travel, vegetation management, and domestic livestock grazing.

Though not in the revised LMP, there is protection provided for YT by an Order for Injunctive Relief (No. C-00-01237 EDL, May 8, 2008). The Order for Injunctive Relief states that the USFS will prohibit all packstock grazing and entry in occupied YT breeding and rearing habitat throughout the breeding cycle (through metamorphosis). In addition, during the breeding and rearing cycle, the USFS will prohibit any packstock entry or grazing within 100 yds of any permanent water source within occupied YT habitat. Each year, the duration of the breeding and rearing cycle is estimated by the “wet” or “dry” year predictions from the California Department of Water Resources Bulletin 120. The packstock prohibition on entry into YT habitats begins 10 days before and extends 80 days after the estimated start of breeding based on the California Department of Water Resources Bulletin 120. An additional stipulation protects YT tadpoles if

they are detected after the “on-date.” It states that if YT tadpoles are observed in a meadow, and this is confirmed by an aquatic biologist, then grazing will stop in all breeding and rearing habitat and up to 100 yds of any permanent water sources in that meadow until after metamorphosis is confirmed by an aquatic biologist. Even if the Order of Injunctive Relief ended, there is direction in the revised LMP that is consistent with its guidance.

Restoration Activities

The USFS determined that restoration activities, as described in the BA, have the potential to adversely affect LCT, PCT, OTC, SNYLF, MYLF, and YT. The revised LMP emphasizes the restoration of degraded ecosystems to improve their resiliency and sustainability. Over the long-term, restoration activities would likely benefit federally-listed species though there may be short-term adverse effects as discussed in the following paragraphs. The USFS considers vegetation and fuels management a restoration activity that could be used in order to increase the potential to conduct larger prescribed burns and to manage some wildfires to meet resource objectives. These activities are more likely to affect SNBS and its habitat, which we discussed in the Fire Management and Vegetation and Fuels Management sections. Since we discussed the effects of these programs above, we will not reiterate them here. The revised LMP also discusses the treatment and eradication of nonnative and invasive species. As mentioned earlier, the Service is not analyzing the effects associated with pesticide and herbicide application in this BO.

The USFS would focus on aquatic restoration in Priority Watersheds identified during the Watershed Condition Framework process and in improving and retaining watershed conditions within the Conservation Watersheds. Active (*e.g.*, use of mechanized equipment) watershed and habitat restoration projects within designated Wilderness are generally limited, but they are not precluded provided they are designed to be consistent with the revised LMP direction for Wilderness and they reduce impacts to Wilderness character (Murphy, *in litt.* 2018). The primary limitation is that mechanized equipment use is prohibited without special exemption in Wilderness, which is almost never requested for restoration projects (Murphy, *in litt.* 2018).

Restoration activities outside of designated Wilderness could involve the use of heavy equipment such as during the improvement of road drainage and stream crossings. In designated Wilderness, restoration activities would generally involve the movement and placement of native materials (*e.g.*, rocks and logs) to disguise impacted areas or discourage human use in these areas to allow passive restoration. Restoration using non-mechanized hand equipment and primitive tools could occur to restore or mitigate human-caused impacts to riparian conservation areas (*e.g.*, small headcuts, degraded stream channels, trampled banks of streams or lakes, degraded meadows, *etc.*) that are unlikely to recover naturally and that are impacting the Wilderness character. Ground disturbance could include activities such as digging, moving of soil, rocks, or logs, moving or planting native vegetation, or removing nonnative species. Ground-disturbing

activities would be limited to the use of hand tools or other non-mechanized equipment due the restrictions on the use of certain types of equipment and activities in designated Wilderness. This may limit the extent and severity of ground-disturbing activities, but it would occur nonetheless.

Certain restoration activities designed and intended for other purposes (*e.g.*, improve habitat) have the potential to affect LCT, PCT, OTC, SNYLF, MYLF, and YT. For example, the USFS may install and/or maintain instream structures for the benefit of the fish species such as limiting the potential for hybridization with or predation by nonnative species. These instream structures could also create ponded water that may create additional habitat that also benefits predatory fish or other nonnative species. Projects that eliminate or reduce pooling of surface water, such as the removal of dams, could result in the desiccation of tadpoles and egg masses leading to injury, death and the loss of recruitment of the amphibian species. Removal of barriers to fish passage (*e.g.*, the creation or enhancement for the passage of aquatic organisms) can facilitate the invasion of predatory fish into new or previously treated areas. This could result in the displacement, injury, or death of LCT, PCT, OTC, SNYLF, MYLF, and YT. Other unintentional consequences of restoration activities could result in harm to LCT, PCT, OTC, SNYLF, MYLF, and YT through changes in water quality and sedimentation at and downstream of areas of activities. The physical removal of nonnative or undesirable plants may result in displacement, injury and death caused by the disturbance and trampling of native riparian vegetation trampling of streambanks and shorelines, use of equipment, and increased sedimentation. The removal of vegetation may reduce cover for fish and amphibians, which increases exposure to predators, increases water temperatures, and increases sedimentation. The presence of humans may displace fish and amphibians and increase their exposure to predators. Humans and equipment may also crush and destroy eggs, tadpoles, and fry.

The USFS would manage invasive aquatic mussels and snails and certain nonnative fish through inspection and cleaning, manual removal, trapping, electroshocking, or other techniques. The use of traps or electrofishing methods could adversely affect LCT, PCT, OTC, SNYLF, MYLF, and YT. For example, if inappropriate settings are used on the electrofishing equipment, it can result in the injury or death of individuals. However, the settings on electrofishing are usually low enough to avoid or minimize the potential for injury or mortality. Personnel working in waterways containing fish or amphibians could displace them from suitable habitat and increase their exposure to predators. Additionally, humans working in waterbodies may crush eggs, tadpoles, or fry, or injure and kill LCT, PCT, OTC, SNYLF, MYLF, and YT.

During restoration activities, personnel may use herbicides to remove invasive plants. The potential impacts from the application of herbicides for invasive plant species control include: off-target drift (movement through the air to areas not intended for treatment) and movement of chemicals through soils. Movement of chemicals on soil through surface runoff (water moves over the surface of a field or treated area) and leaching (water carries herbicides into and ultimately out of the root zone; the portion lost to leaching depends on soil texture, herbicide solubility, and amount and intensity of rainfall) can be a concern in sensitive environments. Herbicide runoff into habitat from heavy rainfall prior to chemical breakdown could also occur. The greatest loss of herbicide in both runoff and leaching occurs when the herbicide is applied directly to the soil surface; there is a risk of accidental spills or misapplication; and equipment malfunction could occur when treating invasive plant

infestations. While these activities can be beneficial to the ecosystem if applied in an appropriate manner, treatments do have the potential to negatively impact LCT, PCT, OTC, SNYLF, MYLF, and YT and their habitats due to herbicide runoff into occupied habitat from heavy rainfall prior to chemical breakdown, drift, misapplication, or accidental releases during transport or transfer of chemicals to or from application equipment. Effects from such releases could range from mortality to abandonment in the area of contamination.

While restoration activities have the potential to adversely affect LCT, PCT, OTC, SNYLF, MYLF, and YT, these effects will likely be of short duration and actually improve habitat for these species over time. The USFS also identified standards and guidelines in the revised LMP to avoid and/or minimize adverse effects. These standards and guidelines include: restoration projects will not result in the long-term degradation of aquatic and riparian conditions, including connectivity at the watershed or subwatershed scale; adverse effects from project activities are acceptable when they are short-term, site-scale, and support or do not diminish long-term recovery of aquatic and riparian resources; before moving to other waterbodies, clean equipment and vehicles when working in waterbodies with known aquatic invasive species; select weed-free plant material for seeding and revegetation projects to reduce the risk of introducing noxious weeds to the disturbed area; ensure that management activities do not adversely affect water temperatures necessary for local aquatic- and riparian-dependent species assemblages; ensure that culverts of stream crossings do not create barriers to upstream or downstream passage for aquatic-dependent species, except where desired to protect native species; and prohibit stream-modifying construction activities within or immediately adjacent to aquatic zone during the spawning season. These measures include limiting pesticide applications where project-level analysis indicates that pesticide applications are consistent with riparian conservation areas desired conditions; design applications to avoid adverse effects to amphibian species and their habitats when pesticide application is proposed within 500 ft of known occupied sites; and, in most cases, apply pesticide by hand application with buffers around aquatic features to mitigate impacts to riparian resources.

Roads and Other Infrastructure

The USFS determined that management activities associated with roads and other infrastructure have the potential to adversely affect LCT, SNYLF, MYLF, and YT. The Service has also included OTC in our analysis because populations occur near developed areas and roads. We are unaware of any existing infrastructure or proposed development of infrastructure located within or adjacent to occupied habitat for LCT or OTC so our analysis for these species will be limited to the potential adverse effects associated with road maintenance. The PCT, SNYLF, MYLF, and YT are primarily located within designated Wilderness where there are no roads or other infrastructure. There would be no effect to these species and their habitats in these areas. There are existing paved roads in a small portion of habitat occupied by YT occupied outside of designated Wilderness (*i.e.*, Lake Mary) and habitat previously occupied by SNYLFs (*i.e.*, Coyote Management Unit). There is no overlap between existing roads and infrastructure with PCT and SNBS habitat; therefore, there would be no effect to PCT and SNBS, or their habitats.

Potential adverse effects from motorized and non-motorized road maintenance include harassment, injury and death of the animals. Amphibians have several characteristics that make them vulnerable to the effects from road maintenance. First, amphibians move among multiple habitats during their active season which may require crossing roads and trails; second, they move slowly and thus cannot easily avoid maintenance vehicles or equipment; third, they are relatively small and hard to see which makes them difficult to avoid; and fourth, they have permeable skin which may make them more susceptible to the toxic effects of chemicals from vehicles or used for road maintenance (Andrews *et al.* 2008). These characteristics increase the likelihood that the amphibians, specifically YT and SNYLF, may be struck and injured or killed by vehicles or equipment. Road maintenance activities could also lead to an increase in disturbance (*e.g.*, noise), chemical contamination, and the introduction of nonnative and invasive plant and animal species. Noise from vehicles or equipment may cause amphibians to cease their normal behavior. Yosemite toads have been observed halting trilling during breeding season when vehicles drove by an active breeding site in a high elevation meadow, potentially modifying breeding behavior. Roadways are paths for contaminants to enter waterways as vehicles can leak oil, and sometimes fuel, that wash from road surfaces, becoming a source of petroleum product contamination to surface waters and amphibians that come into contact with them. As mentioned above, the permeable skin of amphibians make them more susceptible to the toxic effects of chemicals. The adverse effects of these pollutants to amphibians include reduced survival, growth, and metamorphosis, altered physiology and behaviors, deformities in tadpole oral cavities, and elevated levels of stress hormones (Mahaney 1994, Lefcort *et al.* 1997, Andrews *et al.* 2008, Beebee 2013, Brown *et al.* 2014).

Road maintenance activities such as the maintenance, replacement, or improvement of stream crossings and culverts or management of road drainage have the potential to harass, injure, or kill LCT and OTC. This would most likely occur if equipment or people are working in occupied aquatic habitat. Equipment or people may crush LCT and OTC, resulting in their injury or death, or displace them from suitable habitat. Redds, eggs, and fry may also be crushed. However, this is unlikely since there are no roads that cross LCT or OTC habitat. As described above, road maintenance activities could degrade aquatic habitat and injure or kill LCT and OTC through chemical contamination, removing vegetation, increasing erosion and sedimentation, and the introduction of nonnative and invasive plant and animal species.

Chemical or toxin contaminants can have numerous effects on aquatic animals, especially fish. In general, the effects of heavy metal or petroleum contamination are because many of their sensitive organs are in constant contact with their environment. A review of the effects of heavy metals on salmonids, which are closely related to LCT, by Price (2013) indicates that heavy metals can have a variety of effects on individuals, from mortality (lethal exposure) to reductions in swimming speed, feeding rates, predation success, territoriality, egg/larval survival, growth and reproduction rates, olfaction, and impairment of development, mobility, and cellular functions over time (sublethal exposure). Similarly, there are a variety of effects, ranging from lethal to sublethal, to fish when they are exposed to varying levels of petroleum contamination (see Malins (1977) for specific information).

Road maintenance may remove adjacent vegetation that eliminates cover for LCT and OTC, and increases erosion and sedimentation into aquatic habitats. Similar to the effects discussed in the above sections, road maintenance activities can result in changes to vegetation, which affects cover and water temperature, or increase sedimentation into aquatic habitat, which would affect the amount of suitable habitat for LCT and OTC. The use of roads may also affect plant species composition by changing soil and habitat properties, increasing the dispersal of nonnative and invasive plant species, and by altering biotic interactions and population dynamics (Avon *et al.* 2013). Roads can also facilitate movement of vectors for invasive species of plants (Tyser and Worley 1992, Forman *et al.* 2003) and animals (Rahel 2004). Increases in illegal fishing and illegal introductions of nonnative fish and other aquatic organisms are facilitated by public road access to different water bodies (Rahel 2004).

Drafting of water for road maintenance may result in adverse effects to aquatic habitat for the LCT, OTC, SNYLF, and YT. Although fish can move to suitable locations upstream or downstream, fish are occasionally sucked into unscreened drafting tubes, which could result in injury or mortality. Instream water drafting can substantially affect water flow or configuration of the bed, bank, or channel of streams that results in rapid changes or sustained reductions in flow, reduced dissolved oxygen, and/or increased water temperatures, which could affect LCT, OTC, SNYLF, or YT. In addition to direct hydro-geomorphic impacts, water-quality impacts can occur as a result of road approaches that access the water drafting site. Many water drafting sites have steep approaches and in the absence of adequate drainage or surfacing, these approaches can become chronic sources of sediment and runoff to the channel, which may alter habitat occupied by LCT, OTC, SNYLF, or YT. Vehicles can also leak oil, and sometimes fuel, onto drafting pads, becoming a source of petroleum product contamination to surface waters.

Despite these potential effects, there is little overlap between roads and other infrastructure and LCT, OTC, SNYLF, and YT habitat. This limits their exposure to the effects associated with the management of roads and other infrastructure. The USFS has also included standards and guidelines in the revised LMP to avoid and/or minimize adverse effects. These standards and guidelines include: use screening devices for water drafting pumps and use pumps with low entry velocity to minimize removal of aquatic species from aquatic habitats, including juvenile fish, amphibian egg masses, and tadpoles; protecting riparian conservation areas; when building new roads within conservation watersheds, avoid or minimize increases in sediment production, water capture, or loss of stream connectivity; locate water drafting sites to minimize adverse effects to instream flows and depletion of pool habitat; incorporating site-specific measures to avoid, minimize, or mitigate potential impacts to occupied habitat; and prohibit stream-modifying construction activities within or immediately adjacent to aquatic zone during the spawning season.

Effects to Designated Critical Habitat for the Sierra Nevada Yellow-legged Frog, Mountain Yellow-legged Frog, Yosemite Toad, and Sierra Nevada Bighorn Sheep

The key factor related to the adverse modification determination is whether, with implementation of the proposed Federal action, the affected critical habitat will continue to serve its intended conservation role for the species. Activities that may destroy or adversely modify critical habitat are those that result in a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of the SNYLF, MYLF, YT, and SNBS. Such alterations may

include, but are not limited to, those that alter the physical or biological features essential to the conservation of these species or that preclude or significantly delay development of such features. The role of critical habitat is to support life-history needs of the species and provide for the conservation of the species. The following section summarizes the effects of the proposed action in relation to specific critical habitat PCEs for the SNYLF, MYLF, YT, and SNBS.

Sierra Nevada Yellow-legged Frog and Mountain Yellow-Legged Frog

In general, the PCEs specific to the SNYLF and MYLF are: (1) Aquatic habitat for breeding and rearing; (2) aquatic non-breeding habitat; and (3) upland areas. All of the PCEs for SNYLF and MYLF occur within the action area and many of the programs/activities have the potential to disturb some features of each PCE. For example, some programs/activities may increase erosion and sedimentation into aquatic habitats affecting bank and pool substrates or shallow microhabitat [PCE 1(e)(i) and (ii)] or remove vegetation that provides cover from predators [PCE 2(c)]. Vegetation and fuels management activities that involve earthmoving, yarding, skidding, and construction of temporary roads, skid trails, and landings could increase sediment loads into aquatic habitats via disturbance of soil through use of heavy equipment, removal of vegetation, and soil compaction. Fire (prescribed and natural) would remove vegetation and tree roots that provided soil stability and cover, which could increase soil run-off during rain and snowmelt events, which may increase sedimentation and channel scour. Restoration activities (including invasive species management) and road maintenance could remove vegetation or disturb/compact soil, resulting in increased soil erosion into aquatic habitat. Livestock grazing would result in the removal of vegetation and potentially compact soil in some areas of concentrated grazing, which could result in the following: increase surface run-off and erosion into aquatic habitat affecting bank and pool substrates; the loss of cover used to avoid predators and overwintering refugia due to collapsed streambanks from trampling and removal of streamside vegetation [PCE 2(e)]; and the disturbance or destruction of sunning posts due to livestock moving within or along waterways [PCE 2(b)].

The above programs/activities may also affect features of upland habitat [*i.e.*, PCE 3]. Some of these effects could be beneficial such as fire that removes upland vegetation and reduces canopy cover, thus providing more basking areas [PCE 3(ii)], or restoration activities that remove encroaching vegetation into meadows, which would improve foraging and dispersal habitat [PCE 3(iv)]. Conversely, fire may burn large areas within a catchment that could affect the maintenance of water quality [PCE 3(b)].

The Service anticipates that many of the effects associated with the programs/activities described in the BA would result in localized, temporary adverse effects to some of the PCEs. It is unlikely that these programs/activities would result in the large-scale alteration or removal of PCEs. Finally, as described above in the Effects of the Action section, the USFS has identified numerous standards and guidelines in its revised LMP that would avoid or minimize adverse effects, and likely benefit, to the PCEs of SNYLF and MYLF critical habitat.

Yosemite Toad

The PCEs specific to the YT are: (1) Aquatic breeding habitat; and (2) upland areas. All of the PCEs for YT occur within the action area and many of the programs/activities have the potential to disturb some features of each PCE.

Effects such as increased erosion and sedimentation into aquatic habitat described above would also affect the PCEs of YT critical habitat. In addition to the above, activities such as inappropriate livestock grazing over long periods of time may result in downcut stream channels. Downcut channels become confined within narrow, incised channels and are no longer connected to the historical meadow floodplain, lowering the water table and resulting in faster meadow drying and meadow vegetation receiving less water. This may decrease the amount of available breeding habitat for the YT.

Many of the potential effects to the PCEs described above for upland habitat for SNYLF and MYLF would also apply to PCE 2 for YT critical habitat. This includes the potential for natural and prescribed fire to affect water quality [PCE 2(b)]. Additionally, in upland areas, vegetation and fuels management activities could destroy or alter cover components such as burrows, logs, tree roots, or stumps used as refugia during the summer or winter or for predator avoidance [PCE 2(a)(i), (iv), and (v)]. These same features may be destroyed or altered from recreational activities when humans and animals accidentally crush mammal burrows, dislodge rocks, wood and other cover decreasing available refugia habitat.

The Service anticipates that many of the effects associated with the programs/activities described in the BA would result in localized, temporary adverse effects to some of the PCEs. It is unlikely that these programs/activities would result in the large-scale alteration or removal of PCEs. Finally, as described above in the Effects of the Action section, the USFS has identified numerous standards and guidelines in its revised LMP that would avoid or minimize adverse effects, and likely benefit, to the PCEs of YT critical habitat.

Sierra Nevada Bighorn Sheep

The PCEs of SNBS critical habitat are: (1) Non-forested habitats or forest openings within the Sierra Nevada from 4,000 ft to 14,500 ft in elevation with steep (greater than or equal to 60 percent slope), rocky slopes that provide for foraging, mating, lambing, predator avoidance, and bedding and that allow for seasonal elevational movements between these areas; (2) presence of a variety of forage plants as indicated by the presence of grasses (*e.g.*, *Achnanthera* spp.; *Elymus* spp.) and browse (*e.g.*, *Ribes* spp.; *Artemisia* spp., *Purshia* spp.) in winter, and grasses, browse, sedges (*e.g.*, *Carex* spp.) and forbs (*e.g.*, *Eriogonum* spp.) in summer; and (3) presence of granite outcroppings, containing minerals such as sodium, calcium, iron, and phosphorus that could be used as mineral licks in order to meet nutritional needs (Service 2008c). The action area contains all of these PCEs. Of these PCEs, PCE 2 is most likely to be affected by the programs/activities described in the BA, more specifically, the Fire Management, Vegetation and Fuels Management, and Range Management programs. It is unlikely that the other programs/activities (Recreation, Restoration Activities, and Roads and Other Infrastructure) occur at such a scale or to such a degree that they would affect any of the PCEs.

The Fire Management, Vegetation and Fuels Management, and Range Management programs all include activities that can result in the removal or loss of forage plants, grasses, browse, sedges, and forbs. This could occur when fires (natural and prescribed) burn across the landscape or during projects that thin vegetation. The majority of SNBS critical habitat is located in the Wildfire Maintenance and Wildfire Restoration Zones. Within these two Strategic Fire Management Zones, the USFS would evaluate wildfires from natural sources such as lightning to determine if they could be managed with a less than full-fire suppression response. Under this scenario, the Service cannot predict the acreage that may burn due to natural fire ignitions. However, it means wildfires may burn a larger area than in the past when the USFS focused on extinguishing fires or limiting their size. As a result, there may be a greater loss of forage, grasses, browse, sedges, and forbs. But we expect that these effects will be temporary and short-term in nature, and would not occur to such an extent that all forage would be lost.

Livestock grazing would result in the removal of forage, and the inappropriate management of livestock may result in the degradation of foraging habitat over time. The scope of these effects would be limited since the USFS would manage grazing on an allotment in accordance with an Allotment Management Plan and Annual Operating Instructions, which could include annual adjustments to management based on monitoring and site-specific objectives. Additionally, livestock are unlikely to completely remove all available forage since some of it would be inaccessible, grazing would be limited to a specific period of time, and utilization rates would be implemented according to vegetation conditions and watershed conditions.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. The following information is from the BA.

Within the administrative boundary of the Inyo NF, the LADWP owns and manages approximately 20,400 ac of lands primarily around Pumice Valley southwest of Mono Lake and around Crowley Lake. Other private entities own approximately 32,300 ac scattered in mostly smaller parcels.

A wide variety of activities may occur on private land that could affect federally-listed species and their habitats. These activities could include: agriculture; livestock grazing (which could include cattle, domestic sheep and goats); fire suppression and prescribed burning; vegetation management including timber and vegetation management; rangeland management; land conversion from habitat to developments; road development and uses; maintenance and development of power line right-of-ways and facilities; noise and actions from typical land use activities that create disturbances.

The California Department of Forestry and Fire reviews and permits timber management on private and State lands, as well as provides fire suppression and support for prescribed fire on State and private lands. They also support private land actions to address fuels management, remove dead and dying trees, reforest and revegetate lands, and support sustainable forest lands by private landowners. We mentioned the effects associated with these activities in the section

on Vegetation and Fuels Management section; therefore, we will not reiterate those effects here. It is unlikely these activities would exacerbate the adverse effects of the proposed action given the limited amount of private land that is dispersed across the action area.

The CDFW is responsible for management of fish and wildlife populations in the action area. This includes surveys and monitoring of federally-listed species. The CDFW monitors and manages mountain lion predation in conjunction with its Sierra Nevada Bighorn Sheep Recovery Program. The CDFW may also conduct species management activities for the SNYLF and MYFL, such as nonnative fish removal to benefit federally-listed species, visual encounter surveys, and capturing for disease testing, captive rearing, reintroductions, or translocations. The CDFW stocks fish at select sites within the action area. Nonnative fish stocking has been evaluated to reduce the probability of effects to federally-listed species (ICF Jones and Stokes 2010).

The CDFW frequently uses electrofishing methods to sample and monitor populations of fish in the action area. Adverse effects to LCT, PCT, and OTC at the population level are not expected since there would likely be minimal injury or mortality of LCT, PCT, and OTC. This is because the settings used are low enough to avoid causing injury or mortality. Additionally, in some instances, electrofishing methods may not be appropriate when sampling or monitoring some populations. The electrofishing program also only occurs on a periodic basis unless it is part of an intensive nonnative fish eradication project using mechanical methods.

Cumulative effects are likely to affect LCT, PCT, OTC, SNYLF, MYLF, YT, and SNBS and their habitat (including designated critical habitat) in a manner similar to that described in the effects analysis of this BO. Although quantifying an incremental change in survival for these federally-listed species due to cumulative effects is not possible, it is reasonably likely that the cumulative effects will have small, short-term negative effects on LCT, PCT, OTC, SNYLF, MYLF, YT, and SNBS and their habitat (including designated critical habitat) to varying degrees.

CONCLUSIONS

When determining whether a proposed action is likely to jeopardize the continued existence of a species, we are required to consider whether the action would “reasonably be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species” (50 CFR 402.02).

After reviewing the current status of LCT, PCT, OTC, SNYLF, MYLF, YT, and SNBS, the environmental baseline for the action area, the effects of the proposed Federal programmatic action, and the cumulative effects, it is the Service’s biological opinion that the implementation of the six programs/activities in the revised LMP, as proposed, is not likely to jeopardize the continued existence of LCT, PCT, OTC, SNYLF, MYLF, YT, and SNBS. We base our conclusion on the following:

1. The Restoration Activities, Fire Management, and Vegetation and Fuels Management programs are designed generally to protect, maintain, or improve overall conditions on

the Inyo NF, and lands administered by the Inyo NF, including habitat for LCT, PCT, OTC, SNYLF, MYLF, YT, and SNBS.

2. The direction provided in the revised LMP, when properly implemented and coupled with site-specific conservation measures, will either avoid and/or minimize the adverse effects associated with the six programs/activities on the LCT, PCT, OTC, SNYLF, MYLF, YT, and SNBS.
3. The USFS will analyze site-specific projects associated with these six programs/activities for effects to LCT, PCT, OTC, SNYLF, MYLF, YT, and SNBS and will conduct future section 7 consultations for all activities that may affect them.
4. The USFS will conduct future section 7 consultations for all activities that could affect SNYLF, MYLF, YT, and SNBS designated critical habitat.

After reviewing the current status of LCT, PCT, OTC, SNYLF, MYLF, YT, and SNBS, the environmental baseline for the action area, the effects of the proposed Federal programmatic action, and the cumulative effects, it is the Service's biological opinion that the implementation of the six programs/activities within the revised LMP, as proposed, is not likely to result in the destruction or adverse modification of designated critical habitat for SNYLF, MYLF, YT, and SNBS. We base our conclusion on the following:

1. The direction provided in the revised LMP, when properly implemented and coupled with site-specific conservation measures, will either avoid and/or minimize the adverse effects of the six programs/activities on SNYLF, MYLF, YT, and SNBS designated critical habitat.
2. The USFS will conduct future section 7 consultations for all activities that may affect SNYLF, MYLF, YT, and SNBS designated critical habitat.

This conclusion is based on the general information currently available about the revised LMP related to the six programs/activities, and does not prejudice future determinations in consultations on site-specific actions under the revised LMP related to these six programs/activities. Any future finding of jeopardy or adverse modification of critical habitat at the site-specific level would invalidate the conclusion of this consultation, and would require reinitiation of consultation.

INCIDENTAL TAKE STATEMENT

No exemption from Section 9 of the ESA is granted in this BO related to USFS's implementation of the revised LMP. The programs/activities described in this BO are likely to adversely affect the LCT, PCT, OTC, SNYLF, MYLF, YT, and SNBS, and designated critical habitat for SNYLF, MYLF, YT, and SNBS. The likelihood of incidental take, and the identification of reasonable and prudent measures and terms and conditions to minimize such take, will be addressed in future project-level consultations. Any incidental take and measures to reduce such take cannot be effectively identified at the programmatic level because of the general nature,

broad geographic scope, and the lack of site-specific information. Rather, incidental take and reasonable and prudent measures may be identified adequately through subsequent actions subject to section 7 consultations at the project level.

Amount or Extent of Take Anticipated

Not applicable.

Effect of the Take

Not applicable.

Reasonable and Prudent Measures and Terms and Conditions

Not applicable.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to implement recovery actions, to help implement recovery plans, to develop information, or otherwise further the purposes of the ESA.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, we request notification of the implementation of any conservation recommendations.

Listed Species

The following conservation recommendations will help ensure long-term survival and recovery of LCT, PCT, OTC, SNYLF, MYLF, YT, and SNBS on the Inyo NF:

1. Continue support and participation on the LCT Management Oversight Group.
2. Continue support and involvement in inventories and monitoring of LCT and their occupied habitats on the Inyo NF.
3. Coordinate with the Service on habitat restoration projects for LCT in O'Harrel Creek.
4. Continue support and involvement on implementing the PCT Revised Recovery Plan.
5. Continue to collaborate with the Service and CDFW on projects that would maintain and, if necessary, improve habitat for OTC on the Inyo NF.
6. Continue support and involvement in inventories and monitoring of SNYLF, MYLF, YT, and their habitats on the Inyo NF.

7. Continue support and involvement in the development or implementation of conservation strategies, recovery plans, or any other applicable guidance documents for the recovery of SNYLF, MYLF, and YT.
8. Continue support and involvement in working groups, recovery teams, recovery implementation teams, or any other applicable groups/teams that meet to discuss the recovery of SNYLF, MYLF, and YT.
9. Continue support of the CDFW's Sierra Nevada Bighorn Sheep Recovery Program.
10. Continue support and involvement in the development or implementation of guidance documents, conservation strategies, recovery plans, or any other applicable documents developed to inform actions that contribute to the recovery of SNBS.
11. Continue support and involvement in working groups, recovery teams, recovery implementation teams, or any other applicable groups/teams that meet to discuss the recovery of SNBS.

Candidate Species

The following conservation recommendations will help ensure long-term protection of whitebark pine (*Pinus albicaulis*) and Sierra Nevada Distinct Population Segment of the Sierra Nevada red fox (*Vulpes vulpes necator*) on the Inyo NF:

1. Continue support and involvement in the conservation of whitebark pine by implementing the relevant portions of the rangewide restoration strategy (Keane *et al.* 2012) and regional conservation strategies as they are developed for the species.
2. Share any monitoring efforts (*e.g.*, sightings) with the Sierra Nevada Red Fox Working Group and Service.
3. Develop an educational program to inform individuals recreating on USFS land about the special status of the Sierra Nevada red fox and to prevent feeding or harassing of them.

Species of Concern

The following conservation recommendations would help ensure long-term protection of California spotted owl (*Strix occidentalis occidentalis*), Inyo Mountains slender salamander (*Batrachoseps campi*), Panamint alligator lizard (*Elgaria panamintina*), Bi-State sage-grouse, Owens and Long Valley speckled dace (*Rhinichthys osculus* ssp.), and Ramshaw Meadows sand-verbena (*Abronia alpina*) on the Inyo NF:

1. The Service published a positive 90-day finding to list California spotted owl on September 18, 2015 (Service 2015). The Service has initiated a status review for the California spotted owl and at the conclusion of this review we will issue a 12-month finding on whether or not the Service believes listing is warranted. The USFS has initiated a Conservation Strategy for the California spotted owl. When complete, the

Conservation Strategy should provide management direction for the long-term persistence of the species and the habitat upon which it depends. We encourage the Inyo NF to participate in this effort and implement the Conservation Strategy once completed.

2. Continue to support and coordinate with the Service, CDFW, universities, and others interested in conducting research and/or monitoring of Inyo Mountains slender salamander and Panamint alligator lizard.
3. Continue support and involvement in the development or implementation of guidance documents, conservation strategies, or any other applicable documents developed to protect the habitat of Inyo Mountains slender salamander and Panamint alligator lizard.
4. Continue support and involvement in working groups or any other applicable groups/teams that meet to discuss the long-term conservation of Inyo Mountains slender salamander, Panamint alligator lizard, and each species' habitat.
5. Continue to work with the BLM, Nevada Department of Wildlife, and CDFW to survey Inyo FS lands for the Bi-State sage-grouse.
6. Protect Bi-State sage-grouse nesting, brood-rearing, and wintering habitat on Inyo NF lands and, if necessary, restore and enhance those disturbed or degraded habitats.
7. Continue to work with partners to implement State and local conservation plans which guide monitoring and threat identification and abatement. We encourage the continued engagement of local, State, and Federal wildlife biologists in the project planning process.
8. We recommend reliance on the latest Bi-State sage-grouse conservation guidance in the Bi-State Action Plan (Action Plan; Bi-State Technical Advisory Committee 2012), or any other applicable guidance documents. We encourage and support the implementation of all appropriate management direction identified in the Action Plan as the analysis and proposed projects are conducted. Additional recent guidance to consult during the planning process includes:
 - Secretarial Order No. 3336 – “Rangeland Fire Prevention, Management, and Restoration,” and subsequent plans and reports
 - BLM 2015 – “Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessment; Northern Great Basin”
 - Chambers *et al.* 2014 – “Using Resistance and Resilience Concepts to Reduce Impacts of Invasive Annual Grasses and Altered Fire Regimes on the Sagebrush Ecosystem and Greater Sage-Grouse: A Strategic Multi-Scale Approach”
9. Continue to collaborate with the Service and CDFW on projects that would maintain and, if necessary, improve habitat for Owens and Long Valley speckled dace on the Inyo NF.

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10. Identify suitable sites on the Inyo NF that could support additional populations of Owens and Long Valley speckled dace.
11. Continue to coordinate and collaborate with the Service on projects involving the Ramshaw Meadows sand-verbena.

REINITIATION REQUIREMENT

This concludes formal consultation of the Inyo National Forest Land Management Plan Revision (Fresno, Inyo, Madera, Mono, and Tulare Counties, California and Esmeralda and Mineral Counties, Nevada). As required by 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) The amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this BO; or (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this BO.

The Consolidated Appropriations Act, 2018 (also called the FY 2018 Omnibus budget legislation) included an amendment to Section 6(d) of the Forest and Rangeland Renewable Planning Act of 1974 (16 U.S.C. 1604(d)) that addressed consultation related to Forest Plans. Essentially, relevant to the revised LMP BO, the Secretary of Agriculture is not required to reinitiate Forest Plan consultation for newly listed species or designation of critical habitat for 15 years following approval of the plan. If a Forest Plan is more than 15 years old then there is a 5 year exemption from the date of listing before consultation would be required.

This only addresses Forest Plan consultations. The USFS is still required to do project-level consultations and is still required to consult on developing new plans, or amending or revising existing Forest Plans.

There is no exemption from section 9 of the ESA granted under this BO for this programmatic action. Therefore, the USFS would need to reinitiate consultation if items 2 and 3 occurred.

Please reference File No. 2018-F-0098 in future correspondence concerning this BO. We appreciate the cooperation of your staff throughout this consultation process. If you have any questions regarding this consultation, please contact me or Shawna Theisen at (775) 861-6300.

Sincerely,

Carolyn Swed
Field Supervisor

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